DRAFT FINAL
EXPANDED ENGINEERING EVALUATION/COST ANALYSIS (EEE/CA)
FOR THE
McLAREN TAILINGS SITE
COOKE CITY, MONTANA

Engineering Services Agreement DEQ/MWCB 401027
Task Order Number 05

Prepared for:

Mr. John Koerth
Montana Department of Environmental Quality
Mine Waste Cleanup Bureau
P. O. Box 200901
Helena, Montana 59620

Prepared by:

Pioneer Technical Services, Inc.
P.O. Box 3445
Butte, Montana 59702

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7.0 DEVELOPMENT AND SCREENING OF RECLAMATION ALTERNATIVES

The waste sources identified at the McLaren Tailings Site include one waste rock dump (approximately 56,200 cubic yards spread over 5.2 acres) and one partially reclaimed mill tailings impoundment (approximately 239,000 cubic yards spread over 11.6 acres, including the dam embankment located on the west side of the tailings and the existing soil cover). The tailings are impounded directly within the valley bottom of the Soda Butte Creek drainage. Currently, Soda Butte Creek flows through an artificial by-pass channel constructed along the north side of the tailings impoundment. Various surface water investigations conducted at the site have determined that Soda Butte Creek is a losing stream in the vicinity of the tailings impoundment and likely provides a source of perennially infiltrating water into the tailings impoundment, as evidenced by several seeps discharging from the toe of the dam embankment. The major COCs at the McLaren Tailings Site include: Fe, Cu, and acid rock drainage (resulting from water seeping through the on-site waste sources).

7.1 IDENTIFICATION AND SCREENING OF RECLAMATION ALTERNATIVES

The purpose of identifying and screening reclamation alternatives is to eliminate those alternatives that are unfeasible or unpractical while retaining the more practical and effective alternatives. General response actions and process options are evaluated for the contaminated solid media only. No evaluation has been conducted for surface water, groundwater, or off-site stream sediments primarily because reclamation of the contaminated waste sources at the McLaren Tailings Site will mitigate or eliminate impacts to the other environmental media. General response actions potentially capable of meeting the reclamation objectives are identified on Table 7-1.

TABLE 7-1
GENERAL RESPONSE ACTIONS, TECHNOLOGY TYPES, AND PROCESS OPTIONS FOR CONTAMINATED SOLID MEDIA AT THE McLAREN TAILINGS SITE

GENERAL RESPONSE ACTION	TECHNOLOGY TYPE	PROCESS OPTIONS
No Action	Not Applicable	Not Applicable
Institutional Controls	Access Restrictions	Fencing Land Use Control
Engineering Controls	Containment	Soil Cover Multimedia Cover Asphalt/Concrete Cover
	Surface Controls	Consolidation Grading Revegetation Erosion Protection Run-on/Runoff Control
	On-Site Disposal	Fully Encapsulated Repository Other Repository
	Off-Site Disposal	Haz. Waste Landfill Solid Waste Landfill Permitted Tailings Facility
Excavation and Treatment	Fixation/Stabilization	Pozzolan/Cement Based
	Reprocessing	Milling/Smelter
	Physical/Chemical Treatment	Soil Washing Acid Extraction Alkaline Leaching
	Thermal Treatment	Fluidized Bed Reactor Rotary Kiln Multi-Hearth Kiln Vitrification
In-situ Treatment	Physical/Chemical Treatment	Stabilization/Solidification Soil Flushing
	Thermal Treatment	Vitrification

The following sections describe general treatment options potentially applicable to the McLaren Tailings Site, as well as the No Action Alternative and Institutional Controls. Section 7.2 summarizes the reclamation alternatives considered to be the most applicable to the McLaren Tailings Site. The preferred alternative for the site may be a combination of these alternatives. Initial screening of the alternatives identifies those alternatives appropriate for subsequent detailed analyses. Alternatives that pass the initial screening process are evaluated in detail in Section 8.0 of this document.

7.1.1 No Action

Under the No Action Alternative, no future reclamation or monitoring would occur at the site. The no action response is a stand-alone response that is used as a baseline against which candidate reclamation alternatives are compared.

7.1.2 Institutional Controls

Potentially applicable Institutional Controls consist of land use and access restrictions. Land use restrictions would limit the potential future uses of the land. Limitations may be applicable in the case of no action, on-site disposal, in-place containment, or other reclamation alternatives that would result in leaving contaminated material on-site that could be compromised by land use activities (i.e., grazing, recreation, etc.).

Institutional Controls involve implementing access restrictions, such as fencing and land use control. These restrictions are implemented to preclude the future development of the impacted area or to protect an implemented remedy. This type of action does not achieve a specific clean up goal; however, Institutional Controls will be considered as a method to augment other reclamation alternatives.

7.1.3 Engineering Controls

Engineering Controls are used primarily to reduce the mobility of contaminants by creating a barrier that prevents transport of waste from the contaminant source to the surrounding environment. Engineering Controls do not actually reduce the volume or toxicity of the contaminated material. Engineering Controls may include containment/capping, revegetation, run-on/runoff controls, and/or disposal. The following subsections describe Engineering Controls in more detail

7.1.3.1 Containment

Containment technologies are used as source control measures to divert surface water from the contaminated media and to minimize infiltration (and subsequent formation of leachate) of surface water/precipitation into the underlying contaminated media. By isolating a waste source, potential health risks that may be associated with exposure (direct contact or airborne releases of particulates) to the contaminated media are reduced. The cap or cover design is a function of the

degree of hazard posed by the contaminated media and may vary in complexity from a simple soil cover to a multi-layered, lined cap. Cap performance standards are included in 40 Code of Federal Regulations (CFR) 264.310 addressing hazardous waste landfill closure requirements. These performance standards may not always be appropriate, particularly in instances where the toxicity of the contaminated media is relatively low, where the cap is intended to be temporary, where there is low precipitation, or where the waste is not leached by infiltrating rain water. Specific cap construction is partially driven by the desired land use following cap construction.

Capping is appropriate whenever contaminated materials are to be left in place at a site, such as when total excavation and removal or treatment would be cost-prohibitive. Capping is considered a standard construction practice; equipment and construction methods associated with capping are readily available and design methods and requirements are well established and understood.

7.1.3.2 Surface Controls

Surface controls are used to minimize contaminant migration. Surface controls alone may not be appropriate in areas where direct human contact is a primary concern. In these instances, surface controls are commonly integrated with containment technologies to provide further protection. Surface control process options are directed at controlling water and wind impacts on contaminated materials. These options include consolidation, grading, revegetation, and erosion controls.

Consolidation involves grouping wastes of similar type in a common area for more efficient management or treatment. Consolidation is beneficial in areas where multiple smaller waste sources are present and wastes are located in sensitive areas (i.e., residential areas or floodplains). Grading is used to reshape and compact waste areas to reduce slopes and to manage run-on/runoff and infiltration of surface water and control erosion. Depending on the site conditions, periodic maintenance may be necessary to control subsidence and erosion problems after closure.

Revegetation involves adding soil amendments to a limited depth in the waste in order to provide nutrients and organic materials to establish vegetation. In addition, neutralizing agents and/or additives to improve pH conditions and/or the water storage capacity of the wastes may be appropriate. Revegetation is essential in effectively controlling water and wind erosion processes and minimizing infiltration of water through plant evapotranspiration processes. Revegetation generally involves the selection of appropriate plant species, preparation of the seeding area, seeding and/or planting, mulching and/or chemical stabilization and finally fertilization. Depending on the success of revegetation, the site may require maintenance in order to establish a self-sustaining plant community.

Erosion protection includes using erosion resistant materials to control water and wind impact on the contaminated media surface. Processes include surface water diversions, application of mulch and natural or synthetic fabric mats, and riprap. The erosion resistant materials are strategically placed based on knowledge of the drainage area characteristics, slopes, vegetation

types and densities, soil texture, and precipitation data.

7.1.3.3 Off-Site Disposal

Off-site disposal involves placing contaminated material in an engineered containment facility located outside the site boundary. Off-site disposal options may be applied to pre-treated or untreated contaminated materials and may depend on the TCLP results to determine the hazardous classification of the waste involved. Materials failing to meet the TCLP criteria may require disposal at a Resource and Conservation Recovery Act (RCRA) permitted Treatment, Storage, and Disposal (TSD) facility. Conversely, less toxic materials could possibly be disposed in an approved off-site sanitary landfill or other approved disposal facility.

7.1.3.4 Excavation and Treatment

Excavation and treatment involves the removal of contaminated media and subsequent treatment via a specific treatment process that chemically, physically, or thermally results in a reduction of contaminant toxicity and/or volume. Treatment processes have the primary objective of: 1) concentrating the metal contaminants for additional treatment or recovery of valuable contaminants; or 2) reducing the toxicity of the hazardous contaminants.

Excavation can be completed using conventional earth-moving equipment and accepted hazardous materials handling procedures. Precautionary measures, such as temporary stream diversion or isolation, may be necessary for excavating materials contained in the floodplain of a stream. Pumping, containment, and/or treatment of water encountered during excavation may also be necessary in some instances.

7.1.3.5 Fixation/Stabilization

Fixation/stabilization technologies are used to treat materials by physically encapsulating them in an inert matrix (stabilization) and/or chemically altering them to reduce the mobility and/or toxicity of their contaminants (fixation). These technologies generally involve mixing materials with binding agents under prescribed conditions to form a stable matrix. Fixation/stabilization is an established technology for treating inorganic contaminants. The technology incorporates a reagent or combination of reagents to facilitate a chemical and/or physical reduction of the mobility of contaminants in the solid media. Lime/fly ash-based treatment processes and pozzolan/cement-based treatment processes are potentially applicable fixation/stabilization technologies.

7.1.3.6 Reprocessing

Reprocessing involves excavating and transporting the waste materials to an existing permitted mill or smelter facility for processing and economic recovery of target metals. Applicability of this option depends on the willingness of an existing permitted facility to accept and process the material and dispose of the waste by-products. Although reprocessing at active facilities has been conducted in the past, permit limitations, CERCLA liability, and process constraints all

limit the feasibility of this option.

7.1.3.7 Physical/Chemical Treatment

Physical treatment processes use physical characteristics to concentrate contaminants into a relatively small volume for disposal or further treatment. Chemical treatment processes treat contaminants through adding a chemical reagent that removes or fixes the contaminants. The net result of chemical treatment processes is a reduction of toxicity and/or mobility of contaminants in the solid media. Chemical treatment processes often work in conjunction with physical processes to wash the contaminated media with water, acids, bases, or surfactants. Potentially applicable physical/chemical treatment process options include soil washing, acid extraction, and alkaline leaching.

Soil washing is an innovative treatment process that consists of washing the contaminated media with water in a heap, vat, or agitated vessel to dissolve water-soluble contaminants. Soil washing requires that contaminants be readily soluble in water and small enough so that dissolution can be achieved in a practical retention time. Dissolved metal contaminants contained in the wash solution are precipitated as insoluble compounds, and the treated solids are dewatered before additional treatment or disposal. The precipitates form a sludge that would require additional treatment, such as de-watering or stabilization before disposal.

Acid extraction applies an acidic solution to the contaminated media in a heap, vat, or agitated vessel. Depending on temperature, pressure, and acid concentration, varying quantities of the metal contaminants present in the contaminated media would be solubilized. A broader range of contaminants can be expected to be acid soluble at ambient conditions using acid extraction versus soil washing; however, sulfide compounds may only be acid soluble under extreme conditions of temperature and pressure. Dissolved contaminants are subsequently precipitated for additional treatment and/or disposal.

Alkaline leaching is similar to acid extraction in that a leaching solution (ammonia, lime, or caustic soda) is applied to the contaminated media in a heap, vat, or agitated vessel. Alkaline leaching is potentially effective for leaching the majority of metals from the contaminated media; however, the removal of As is problematic.

7.1.3.8 Thermal Treatment

Under thermal treatment technologies, heat is applied to the contaminated media to volatilize and oxidize metals and render them amenable to additional processing and/or to vitrify the contaminated media into a glass-like, non-toxic, non-leachable matrix. Potentially applicable moderate temperature thermal processes, which volatilize metals and form metallic oxide particulates, include the fluidized bed reactor, the rotary kiln, and the multi-hearth kiln. Potentially applicable high temperature thermal treatment processes include vitrification. All components of the contaminated media are melted and/or volatilized under high temperature vitrification. Volatile contaminants and gaseous oxides of sulfur are driven off as gases in the process and the non-volatile molten material containing contaminants is cooled and, in the

process, vitrified.
Thermal treatment technologies can be applied to wet or dry contaminated media; however, the effectiveness may vary somewhat with variable moisture content and particle size. Crushing may be necessary as a pre-treatment step, especially for large and/or variable particle sizes, such as in waste rock dumps. Moderate temperature thermal processes should only be considered as pretreatment for other treatment options. This process concentrates the contaminants into a highly mobile (and potentially more toxic) form. High temperature thermal processes immobilize most metal contaminants into a vitrified slag that would have to be properly disposed. The volatile metals would be removed and/or concentrated into particulate metal oxides that would likely require disposal as hazardous waste. Thermal treatment costs are extremely high compared to other potentially applicable reclamation technologies.

7.1.4 *In-situ* Treatment

In-situ treatment involves treating the contaminated media in place. *In-situ* technologies reduce the mobility and toxicity of the contaminated media and may reduce worker exposure to the contaminated materials; however, *in-situ* technologies allow a lesser degree of control than other *ex-situ* options.

7.1.4.1 Physical/Chemical Treatment

Potentially applicable *in-situ* physical/chemical treatment technologies include stabilization/ solidification and soil flushing.

In-place stabilization/solidification is similar to conventional stabilization in that a solidifying agent (or combination of agents) is used to create a chemical or physical change in the mobility and/or toxicity of the contaminants. The *in-situ* process uses deep mixing techniques to allow maximum contact of the solidifying agents with the contaminated media.

Soil flushing is an innovative process that injects an acidic or basic reagent or chelating agent into the contaminated media to solubilize metals. The solubilized metals are extracted using established dewatering techniques, and the extracted solution is then treated to recover metals or is disposed as aqueous waste. Low permeability materials may hinder proper circulation, flushing solution reaction, and ultimate recovery of the solution. Currently, soil flushing has only been demonstrated at pilot scale.

7.1.4.2 Thermal Treatment

In-place vitrification is an innovative process used to melt contaminated solid media in place to immobilize metals into a glass-like, inert, non-leachable solid matrix. Vitrification requires significant energy to generate sufficient current to force the solid media to act as a continuous electrical conductor. This technology is seriously inhibited by high-moisture content. Gases generated by the process must be collected and treated in an off-gas treatment system. In-place vitrification has only been demonstrated at pilot scale, and treatment costs are extremely high

compared to other treatment technologies.

7.2 SITE-SPECIFIC ALTERNATIVES

This section assembles potential reclamation alternatives from the reclamation technology types and associated process options that passed the initial screening effort presented in Section 7.1. Table 7-2 presents the preliminary reclamation alternatives for the McLaren Tailings Site. These retained alternatives are further screened in this section on the basis of effectiveness, implementability, and relative costs. This preliminary screening is conducted to reduce the number of possible reclamation alternatives requiring detailed evaluation in Section 8.0.

TABLE 7-2
RECLAMATION ALTERNATIVES FOR THE
McLAREN TAILINGS SITE

ALTERNATIVE	ACTION
Alternative 1	No Action
Alternative 2	Institutional Controls
Alternative 3	In-Place Containment
Alternative 4	Partial Removal and In-Place Containment
Alternative 5a	On-Site Disposal in a Fully Encapsulated Repository
Alternative 5b	On-Site Disposal in an Un-Lined Repository with a Multi-Layered Cap
Alternative 5c	On-Site Disposal in a Constructed Repository with a Soil Cover
Alternative 6	Off-Site Disposal in a Nearby Mine Waste Repository
Alternative 7	Off-Site Disposal in a Montana Class II Landfill

7.3 PRELIMINARY EVALUATION AND SCREENING OF ALTERNATIVES

The reclamation alternatives identified in Section 7.2 are described, developed, and subjected to a preliminary evaluation and screening process in this section. The evaluation and screening process is based on the anticipated effectiveness, implementability, and cost for each alternative. This preliminary screening is conducted to identify those alternatives that are not as cost effective or implementable as other alternatives or would not provide a similar degree of risk reduction.

The evaluation of effectiveness includes determining the ability of an alternative to effectively reduce adverse human health or environmental impacts sufficiently to achieve the reclamation goals. The reclamation goals include overall protection of human health and the environment, compliance with ARARs, and short- and long-term effectiveness and/or performance related to

reducing toxicity, mobility, and/or volume of contaminants. The effectiveness screening criteria includes consideration of the nature and extent of the contamination, as well as site-specific conditions, such as geology, hydrology, hydrogeology, climate, current land use, and potential future land use.

The implementability of each alternative is evaluated to consider the technical and administrative feasibility of constructing, operating, and maintaining each reclamation alternative. Technical feasibility considerations include applicability of the alternative to the waste source(s), availability of the required equipment, expertise to execute the alternative, and overall reliability of the alternative. Administrative feasibility considerations include logistical and scheduling constraints. The evaluation of implementability also considers appropriate combinations of alternatives with respect to site-specific conditions.

Cost screening consists of developing conservative order-of-magnitude cost estimates for each reclamation alternative based on a similar set of assumptions. Costs have been developed from screening data and from costs associated with similar reclamation projects conducted by the DEQ/MWCB at other abandoned mines. Unit and total costs presented in the cost evaluations are structured to account for contaminated materials handling, adverse site conditions, and contingencies.

The following sections summarize each identified alternative and whether or not the alternative is retained for further analyses:

7.3.1 Alternative 1: No Action

The No Action Alternative means that no actual reclamation activities would occur at the McLaren Tailings Site to control contaminant migration or to reduce toxicity or volume of the wastes.

Effectiveness - Protection of human health and the environment would not be achieved under the No Action Alternative. Prevention of direct human contact would also not be achieved. No action continues to provide a pathway effecting human health through direct contact. Toxicity, mobility, and volume of contaminants would not be reduced under the No Action Alternative. No action would continue to allow leachate percolation from the tailings impoundment to enter Soda Butte Creek, would allow erosion of the tailings to continue during flood events, and would not reduce the threat of potential catastrophic failure of the tailings dam.

Implementability - Technical and administrative feasibility evaluation criteria do not apply to this alternative.

Cost Screening - No capital or operating costs would be incurred under this alternative.

Screening Summary - This alternative has been retained for further evaluation as required by the NCP.

7.3.2 Alternative 2: Institutional Controls

Alternative 2 includes erecting fences around the waste sources to restrict access to the solid mine waste materials and/or land use restrictions to prevent land development on or near the affected areas.

Effectiveness - Alternative 2 is not protective of important environmental resources. It is not fully protective of human health if implemented as a stand-alone alternative because toxicity, mobility, and volume of the contaminated media would not be reduced. This alternative would continue to allow leachate percolation from the tailings impoundment to enter Soda Butte Creek, and would allow erosion of the tailings to continue during flood events. Additionally, this alternative would not reduce the threat of potential catastrophic failure of the tailings dam.

Implementability - Institutional Controls are implementable based on the criteria of applicability, availability, and reliability. Alternative 2 is considered applicable for minimizing the potential for direct contact and restricting future land development. Fencing materials and construction contractors are readily available. Reliability of this alternative for its intended purpose (protection from direct contact) is considered inadequate due to the level of recreational use of the general area. Due to the unlikelihood of implementing Institutional Controls, administrative feasibility is also considered unfavorable.

Cost Screening - Costs associated with Institutional Controls such as fencing would be lower than the other potential reclamation measures. Capital costs associated with construction of an 8-foot tall, chain-link fence would be approximately $ 90,000.00 (6,000 lineal feet at $15.00/foot). Maintenance costs would likely be less than $1,000/year, on average.

Screening Summary - Alternative 2 will not be considered further as a stand-alone remedial alternative but may be used in conjunction with other selected treatment alternatives.

7.3.3 Alternative 3: In-Place Containment

Alternative 3 involves in-place containment of all waste sources present at the McLaren Tailings Site (recontouring, amendment with lime, cover soil application, revegetation, and run-on/runoff control). Based on the available data, the conceptual design for Alternative 3 includes:

- Install Best Management Practices (BMPs) along Soda Butte Creek to protect the creek during site reclamation activities;
- Install a temporary bridge across Soda Butte Creek near the northwestern edge of the tailings to allow access to the site for the required heavy equipment;
- Excavate and temporarily stockpile approximately 11,000 cubic yards of existing cap

material currently overlying the tailings impoundment (this material would be salvaged for use as a portion of the final cover over the waste rock dump);

- Establish access and develop the proposed borrow area located immediately southwest of the tailings impoundment (development of the borrow area would involve clearing and grubbing of approximately four acres of timber in this area);

- Incorporate lime at the appropriate rate on the surface of the exposed waste rock dump;

- Install salvaged cap material over the recontoured waste rock dump at a nominal thickness of 12-inches;

- Install a 12-inch thick cap of clean cover soil over the surface of the covered waste rock dump;

- Install diversion ditches to facilitate run-on/runoff control around the perimeter of the reclaimed areas;

- Reclaim the borrow area; and

- Revegetate and mulch all disturbed areas upon completion of the construction activities (roads, staging areas, borrow area, stockpile areas, etc.).

The proposed borrow area for Alternative 3 is located immediately southwest of the tailings impoundment, on the timbered bench above the south bank of Soda Butte Creek (see Figure 7-1). The proposed borrow area is located entirely on CAMJAC, Inc. property (owner of the tailings impoundment and the majority of the waste rock dump). Due to existing heavy timber in this area, the proposed borrow area was not accessible with a backhoe or drill rig when the field investigation was conducted by Pioneer during the fall of 2001. Consequently, subsurface conditions in the proposed borrow area were not documented and soil samples were not collected. However, several soil samples were collected along the south perimeter of the tailings impoundment in 2001 (see Figure 3-1); results from these soil samples are assumed to be representative of the proposed borrow area.

Based on analytical results from the field investigation, the potential vegetative cover soil contains very little organic matter (averaging < 1.0 percent), is nutrient-poor, and will require fertilizer application and amendment with organic matter to establish suitable plant growth. If Alternative 3 is chosen to be implemented at the site, the proposed borrow area will need to be thoroughly investigated (prior to completing the detailed reclamation design for the site) to confirm the characteristics and suitability of the cover soil.

Under this alternative, seeding would take place during the fall of the year. The seed mixture and fertilizer would be applied simultaneously to the prepared seedbeds via drill application. Mulch would be applied to promote temporary protection of the disturbed surfaces. Straw mulch (certified weed-free) would be applied over the reclaimed materials with a tow spreader or

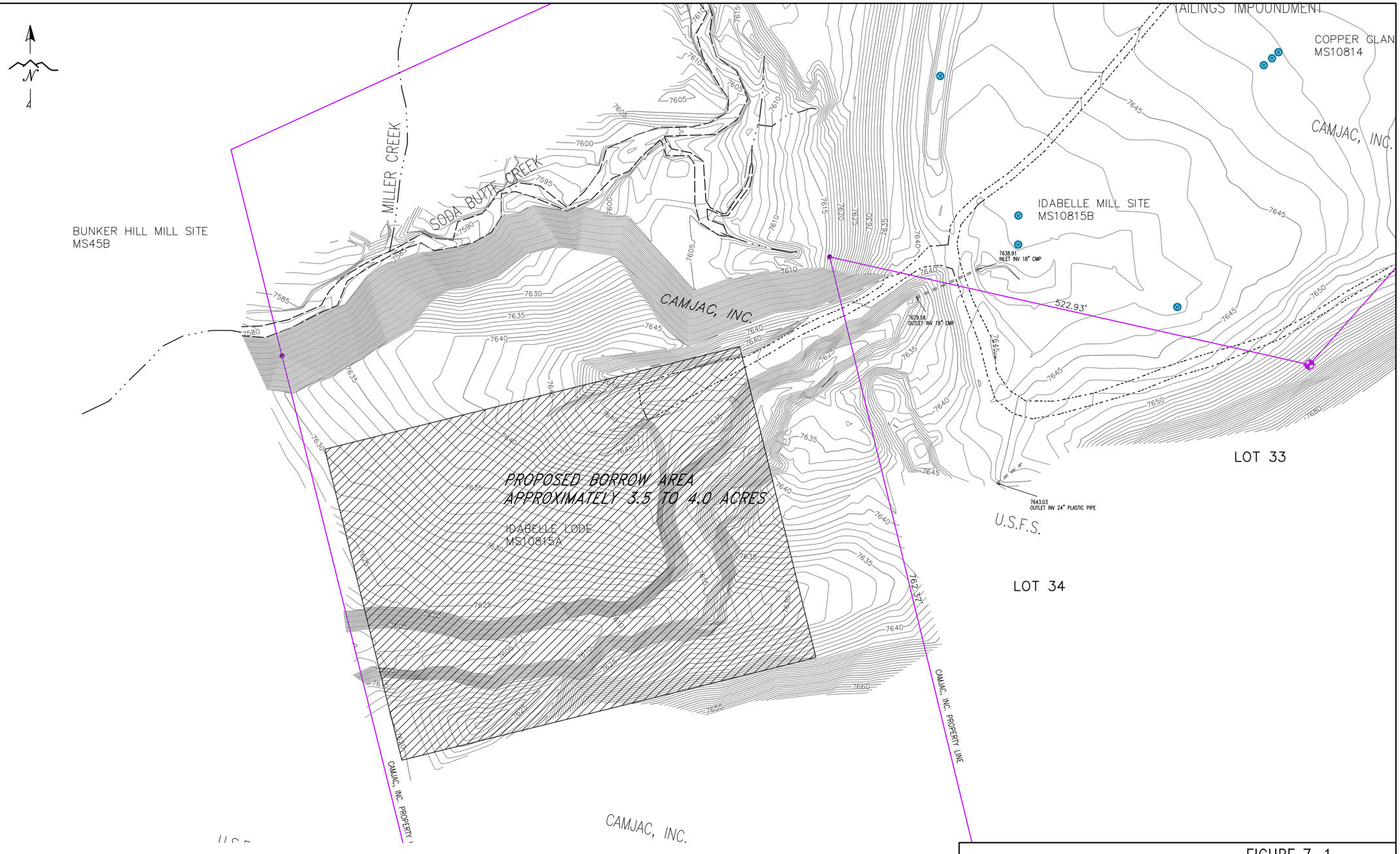

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FIGURE 7-1
PROPOSED BORROW AREA
FOR ALTERNATIVES
4, 6, AND 7
SCALE: 1"=100'
DATE: 5/13/02

MC-EEECA-112.DWG

pneumatic spreader utilizing tucking/crimping as the anchoring mechanism.

Run-on/runoff control would be achieved by construction of necessary diversion structures. Temporary surface water diversions (i.e., culvert, pipe, lined ditch, etc.) may need to be constructed and BMPs would be implemented to prevent runoff and sedimentation into Soda Butte Creek during the construction activities.

Effectiveness - The primary purpose of establishing vegetation over contaminated solid media through in-place containment is to minimize human and terrestrial biota exposure to the contaminants via direct contact and inhalation of entrained dust. In addition, establishing vegetation would limit the contaminants' mobility by effectively stabilizing the surface against wind and surface water erosion. Vegetation also minimizes the potential for migration of vadose zone contaminants by increasing evapotranspiration and decreasing infiltration.

The toxicity and volume of the wastes would not be reduced since no actual treatment of the contaminants would occur. The overall effectiveness of the containment/revegetation program would be enhanced by selecting appropriate plant species that are metal tolerant and adapted to high altitudes and short growing seasons.

Although this alternative would be an improvement over existing conditions; the tailings impoundment would remain in its current potentially unstable location directly in the valley bottom of the Soda Butte Creek drainage. Consequently, the risk of potential catastrophic failure of the tailings dam would remain. Additionally, Soda Butte Creek would remain as a perennial source of infiltrating water into the tailings impoundment.

Implementability - This alternative is both technically and administratively feasible. Incorporation of amendments, soil covers, and establishing vegetation are readily implementable technologies that use conventional construction techniques. Design methods and requirements have been thoroughly tested and the necessary construction equipment and methods are readily available and widely used. Construction methods may vary depending on the complexity of the terrain and the required depth of amendment incorporation.

Cost Screening - The total capital cost for Alternative 3 has been estimated at $1,093,960.00. Cost estimate details are included on Table D-1 in Appendix D.

The following assumptions were used to calculate costs for Alternative 3:

- An estimated 2,000 cubic yards of waste from the old stream channel/erosion gully would be excavated and consolidated within the tailings impoundment;

- An estimated 11,000 cubic yards of existing cap material (on the tailings surface) would be excavated and salvaged for use as sacrificial cover material over the waste rock dump;

- An estimated 1,770 tons of lime would be required to be incorporated at a depth of 6 inches

to adequately neutralize the surface of the waste rock dump prior to installation of the soil cover;

- An estimated 30,000 cubic yards of vegetative cover would be required to cover the tailings and waste rock (this material would be obtained from the borrow area);

- The total surface area that would require revegetation under this alternative is 22.5 acres, which includes the recontoured surfaces of the waste rock dump and tailings impoundment, the borrow area and other disturbed areas; and

- Run-on/runoff control interceptor ditches would be required to protect the reclaimed waste sources. A total of 2,000 lineal feet of ditches is assumed to be required.

Screening Summary – Although this alternative would be an improvement over existing conditions; the tailings impoundment would remain in its current, potentially unstable location directly in the valley bottom of the Soda Butte Creek drainage. Consequently, the risk of potential catastrophic failure of the tailings dam would remain (especially during flood conditions). Additionally, Soda Butte Creek would remain as a perennial source of infiltrating water into the tailings impoundment. Alternative 3 will not be retained for detailed analysis.

7.3.4 Alternative 4: Partial Removal and In-Place Containment

Alternative 4 involves excavating and permanently removing portions of the tailings impoundment to re-establish two historic stream channels (Soda Butte Creek and Miller Creek) back in the valley bottom, within the current footprint of the tailings impoundment. Currently, Soda Butte Creek flows through an artificial by-pass channel constructed along the north side of the tailings impoundment. This by-pass channel is potentially unstable due to the fact that it is not located directly in the valley bottom. Based on available tailings borehole data (historic and recent), it appears that the by-pass channel has been repositioned up to 500 feet north of, and up to 6 feet higher in elevation than, the historic horizontal and vertical alignment, respectively, of Soda Butte Creek. Additionally, historic flow data from Soda Butte Creek indicate that surface water flows are decreasing along this stretch of the stream (i.e., the by-pass channel is leaking). This leaking water ultimately becomes a source of infiltrating water into the tailings impoundment that re-appears as acid drainage seeps along the toe of the tailings dam.

Under Alternative 4, approximately 38,000 cubic yards of tailings would be excavated to re-establish the historic Soda Butte Creek and Miller Creek stream channels, as shown on Figure 7-2. In accordance with the slope stability analyses performed for the site, side slopes excavated through the tailings impoundment would be limited to a maximum slope of 3H:1V and to a maximum vertical height of 16 feet (see Figure 7-3). Figure 7-4 illustrates the step-pool configuration details associated with the reconstructed channel. The excavated tailings material would be consolidated with other on-site wastes (or alternatively, hauled and disposed of at an off-site disposal facility).

Due to static slope stability concerns as well as seismic (liquifaction) concerns, the entire tailings

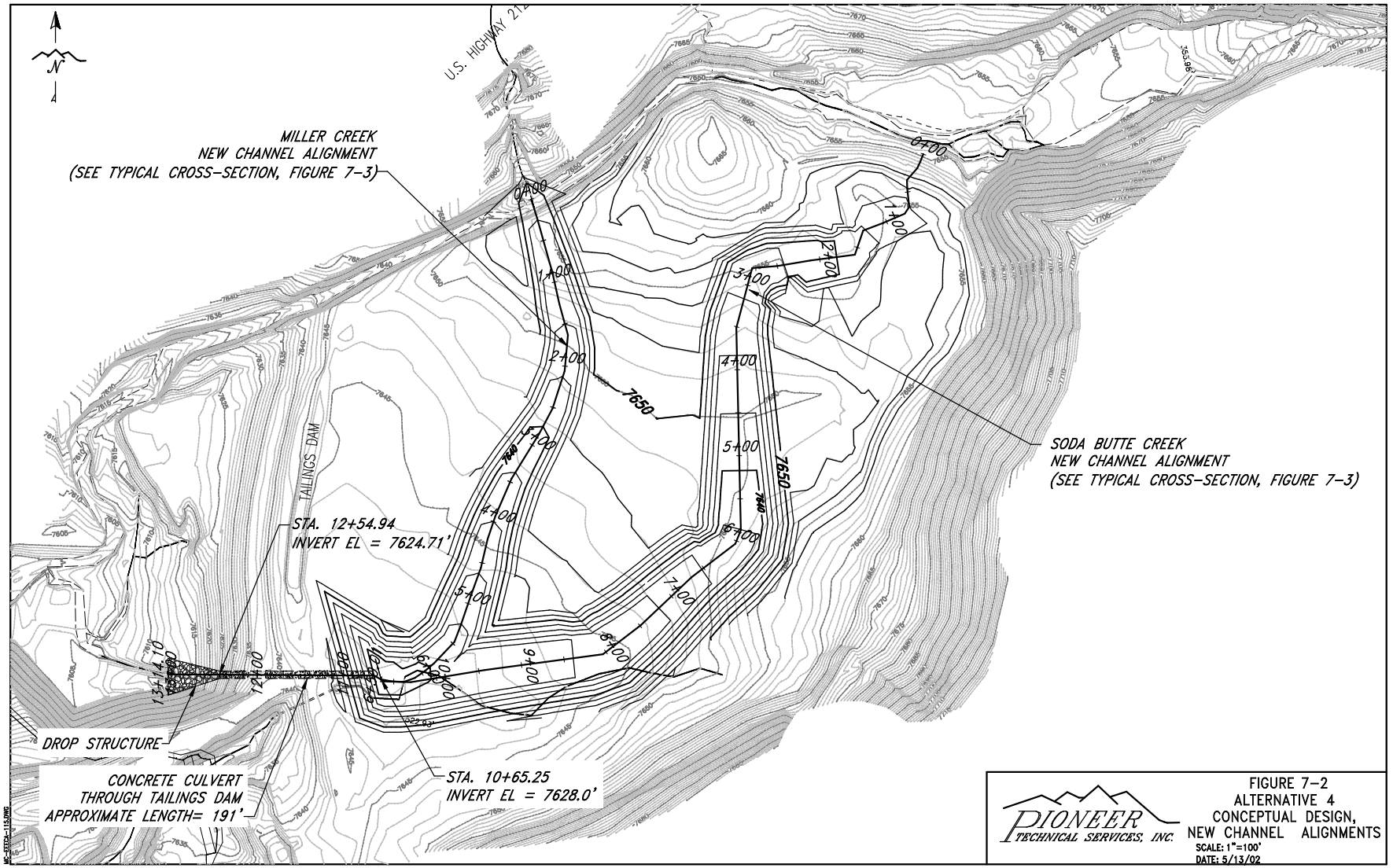

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FIGURE 7-2
ALTERNATIVE 4
CONCEPTUAL DESIGN,
NEW CHANNEL ALIGNMENTS
SCALE: 1"=100'
DATE: 5/13/02

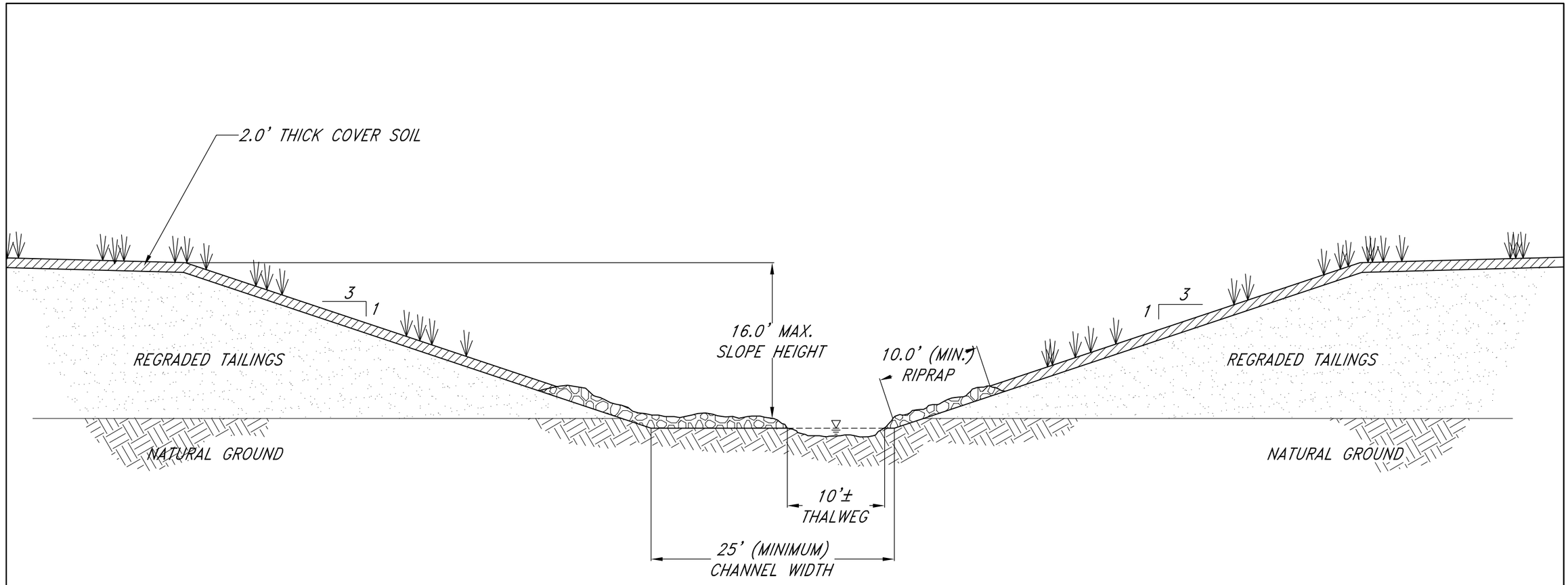

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FIGURE 7-3
SODA BUTTE CREEK/MILLER CREEK
TYPICAL CROSS SECTION
RECONSTRUCTED CHANNEL
SCALE: 1"=10'
DATE: 5/13/02

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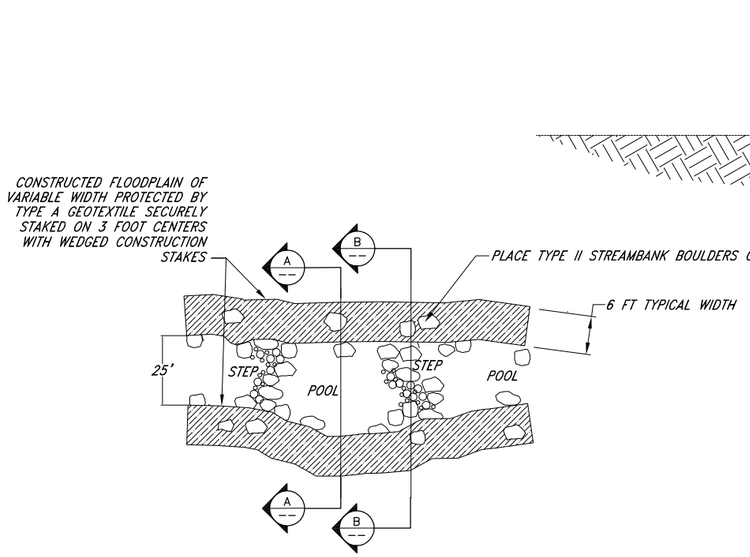
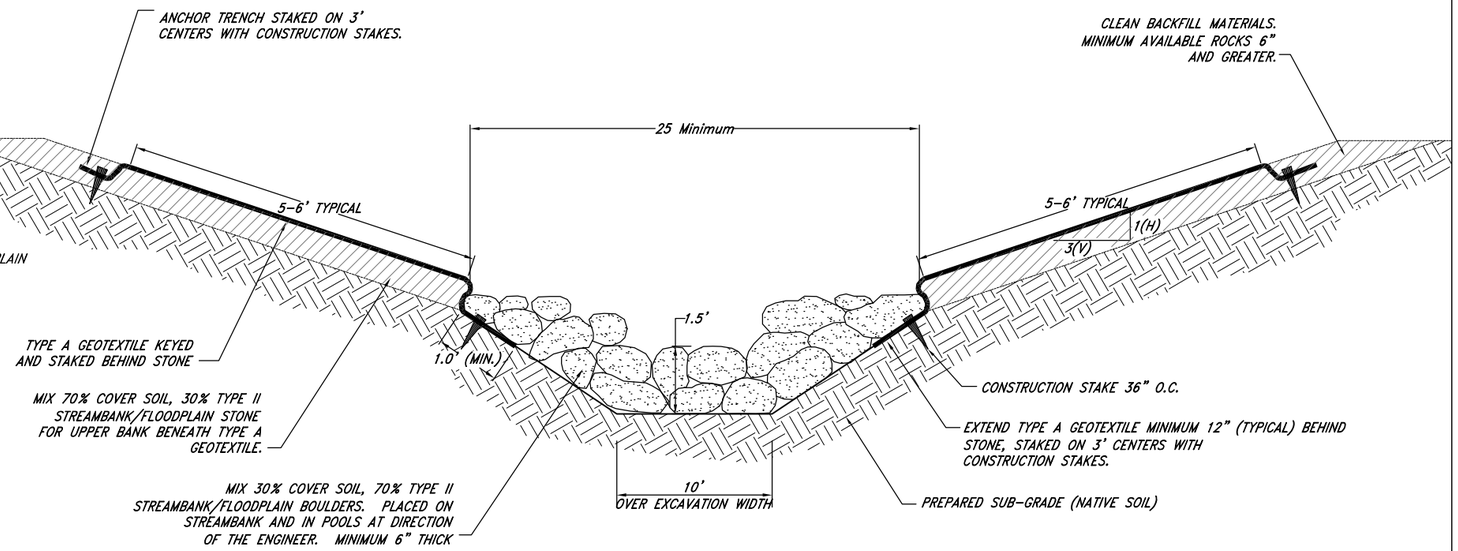
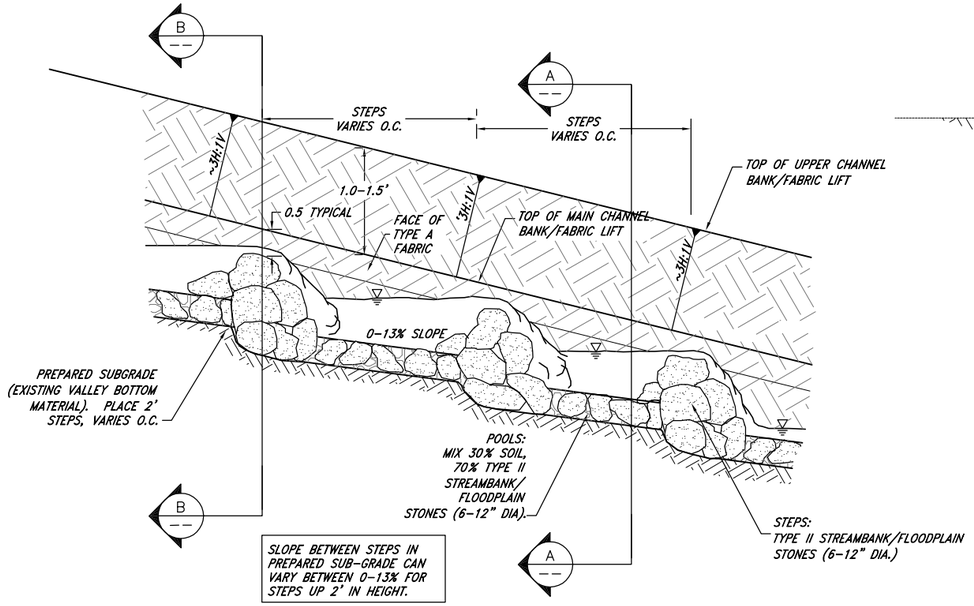


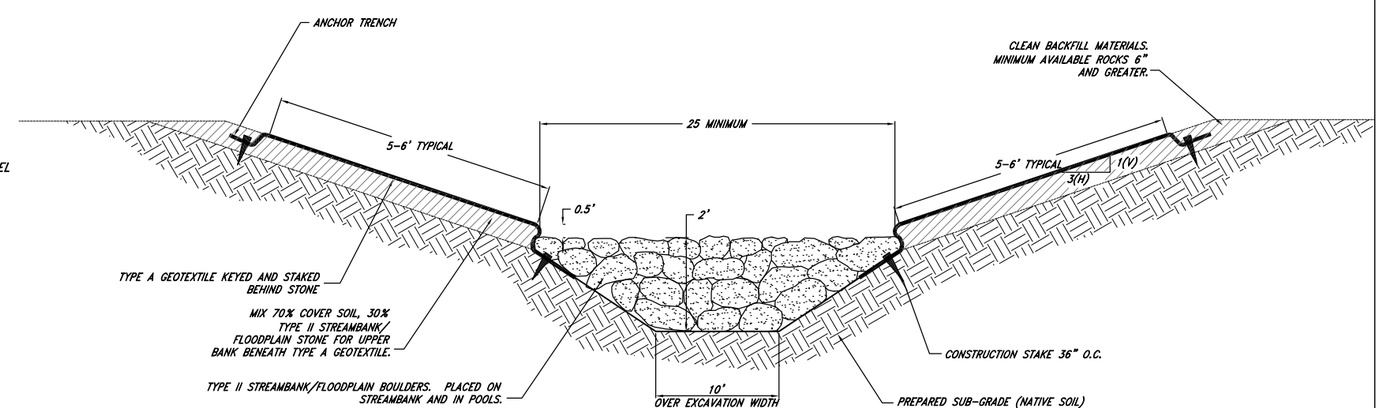
RECONSTRUCTED CHANNEL PLAN VIEW DETAIL 1



POOL CROSS SECTION A



RECONSTRUCTED STREAM CHANNEL PROFILE DETAIL 2



STEP CROSS SECTION B

PIONEER TECHNICAL SERVICES, INC.

FIGURE 7-4
SODA BUTTE CREEK/MILLER CREEK NEW CHANNEL RECONSTRUCTION DETAILS
SCALE: NTS
DATE: 5/13/02

dam would be required to remain completely intact along the west side of the impoundment under this alternative; consequently, a culvert would be installed through the dam to allow passage of the stream flows. A concrete culvert would be specified for installation through the tailings dam, as opposed to galvanized steel, due to the potentially corrosive nature of the tailings material. Installation of the culvert would be accomplished by temporarily installing sheet piling on either side of the culvert alignment, excavating between the parallel courses of sheet piling to establish the desired slope and alignment of the culvert, installing the culvert sections and associated bedding material, and backfilling and compacting the tailings dam.

Based on the available data and the above considerations, the conceptual design for Alternative 4 includes:

- Installing BMPs along Soda Butte Creek to protect the creek during site reclamation activities;

- Installing a temporary bridge across Soda Butte Creek near the northwestern edge of the tailings to allow access to the site for the required equipment;

- Excavating and temporarily stockpiling approximately 11,000 cubic yards of existing cap material currently overlying the tailings impoundment (this material would be salvaged for use as a portion of the final cover over the waste rock dump);

- Establishing access and developing the proposed borrow area located immediately southwest of the tailings impoundment (development of the borrow area would involve clearing and grubbing of approximately four acres of timber in this area);

- Excavating two stream channels through the tailings impoundment in accordance with the alignments and cross-section shown on Figures 7-2 and 7-3, respectively;

- Consolidating the excavated tailings material with other on-site wastes (or transporting the material off-site for disposal);

- Installing a concrete culvert through the tailings dam;

- Incorporating lime at the appropriate rates on the surfaces of the exposed mine wastes (waste rock dump and 3:1 side slopes of the excavated tailings channels);

- Installing salvaged cap material over the recontoured waste rock dump at a thickness of 12 inches;

- Installing a 12-inch thick cap of clean cover soil over the surface of the recontoured wastes;
- Installing a 24-inch thick cap of clean cover soil over the 3:1 side slopes of the excavated tailings channels;

- Re-establishing vertical and horizontal alignment and reconstructing Soda Butte Creek and Miller Creek (approximately 2,050 lineal feet);
- Reclaiming the borrow area; and

- Revegetating and mulching all disturbed areas upon completion of the construction activities (including roads, staging areas, borrow area, stockpile areas, etc.).

The proposed borrow area for Alternative 4 is located immediately southwest of the tailings impoundment, on the timbered bench above the south bank of Soda Butte Creek (see Figure 7-1). The proposed borrow area is located entirely on CAMJAC, Inc. property (owner of the tailings impoundment and the majority of the waste rock dump). Due to heavy timber in this area, the proposed borrow area was not accessible with a backhoe or drill rig when the field investigation was conducted by Pioneer during the fall of 2001. Consequently, subsurface conditions in the proposed borrow area were not documented and soil samples were not collected. However, several soil samples were collected along the south perimeter of the tailings impoundment in 2001 (see Figure 3-1); results from these soil samples are assumed to be representative of the proposed borrow area.

Based on analytical results from the field investigation, the potential vegetative cover soil contains very little organic matter (averaging < 1.0 percent), is nutrient-poor, and will require fertilizer application and amendment with organic matter to establish suitable plant growth. If Alternative 4 is chosen to be implemented at the site, the proposed borrow area will need to be thoroughly investigated (prior to completing the detailed reclamation design for the site) to confirm the characteristics and suitability of the cover soil.

Under Alternative 4, seeding would take place during the fall of the year. The seed mixture and fertilizer would be applied simultaneously to the prepared seedbeds via drill application. Mulch would be applied to promote temporary protection of the disturbed surfaces. Straw mulch (certified weed-free) would be applied over the reclaimed materials with a tow spreader or pneumatic spreader utilizing tucking/crimping as the anchoring mechanism.

Run-on/runoff controls would be achieved by construction of necessary diversion structures. Temporary surface water diversions (i.e., culvert, pipe, lined ditch, etc.) may need to be constructed and BMPs would be implemented to prevent runoff and sedimentation into Soda Butte Creek during the construction activities.

Effectiveness - The major objectives associated with this alternative (re-establishing historic stream channels and covering exposed wastes and establishing vegetation) include stabilizing the hydrologic condition of the site and minimizing human and terrestrial biota exposure to the contaminants via direct contact and inhalation of entrained dust. Placing Soda Butte Creek and Miller Creek back within their historic channels would eliminate a significant source of perennially infiltrating water into the tailings impoundment and would consequently improve the water quality in Soda Butte Creek. In addition, establishing vegetation on the surface of the waste sources would limit the contaminants' mobility by effectively stabilizing the surface

against wind and surface water erosion. Vegetation also minimizes the potential for migration of vadose zone contaminants from water infiltration by increasing evapotranspiration and decreasing infiltration.
The toxicity and volume of the wastes would not be reduced since no actual treatment of the contaminants would occur. The overall effectiveness of the containment/revegetation program would be enhanced by selecting appropriate plant species that are metal tolerant and adapted to high altitudes and short growing seasons.

Implementability - This alternative is both technically and administratively feasible. Incorporation of amendments, soil covers, and establishing vegetation are readily implementable technologies that use conventional construction techniques. Design methods and requirements have been thoroughly tested and the necessary construction equipment and methods are readily available and widely used. Construction methods may vary depending on the complexity of the terrain and the required depth of amendment incorporation.

Factors that could limit the implementability of this alternative include the potential to encounter significant groundwater beneath the tailings when excavating the new channel alignments, and attempting to cut slopes and operate equipment on potentially wet tailings. If significant groundwater is encountered when excavating the materials, dewatering (i.e., pumping) will likely be required during construction. Additionally, pre-treatment of wet materials may be necessary to eliminate free liquids if materials are hauled off-site for disposal. De-watering and/or pre-treatment, if required, could significantly increase project costs.

Cost Screening - The total capital cost for Alternative 4 has been estimated at $2,709,112.00. Cost estimate details are included on Table D-2 in Appendix D.

The following assumptions were used to calculate costs for Alternative 4:

- A total of 38,000 cubic yards of tailings would be excavated and transported for off-site disposal (it is assumed that the tailings would be disposed of in a nearby [within 5 miles] mine waste disposal facility);

- An estimated 1,770 tons of lime would be required to be incorporated at a depth of 6 inches to adequately neutralize the surface of the waste rock dump prior to installation of the soil cover;

- An estimated 5,240 tons of lime would be required to be incorporated at a depth of 12 inches to adequately neutralize and dehydrate the 3:1 cut surface of the tailings prior to installation of the soil cover (incorporating lime to a depth of 12 inches would aid in dehydrating the tailings and would provide a more constructable surface over which equipment could operate to install the soil cover);

- An estimated 36,200 cubic yards of vegetative cover would be required to cover the tailings and waste rock;

- The total surface area that would require revegetation under this alternative is 21.6 acres, which includes the recontoured surfaces of the tailings and waste rock, the borrow area and other disturbed areas;

- Run-on/runoff control interceptor ditches would be required to protect the reclaimed waste sources. A total of 2,000 lineal feet of ditches are assumed to be required; and

- Approximately 2,050 lineal feet of Soda Butte Creek and Miller Creek would require stream reconstruction.

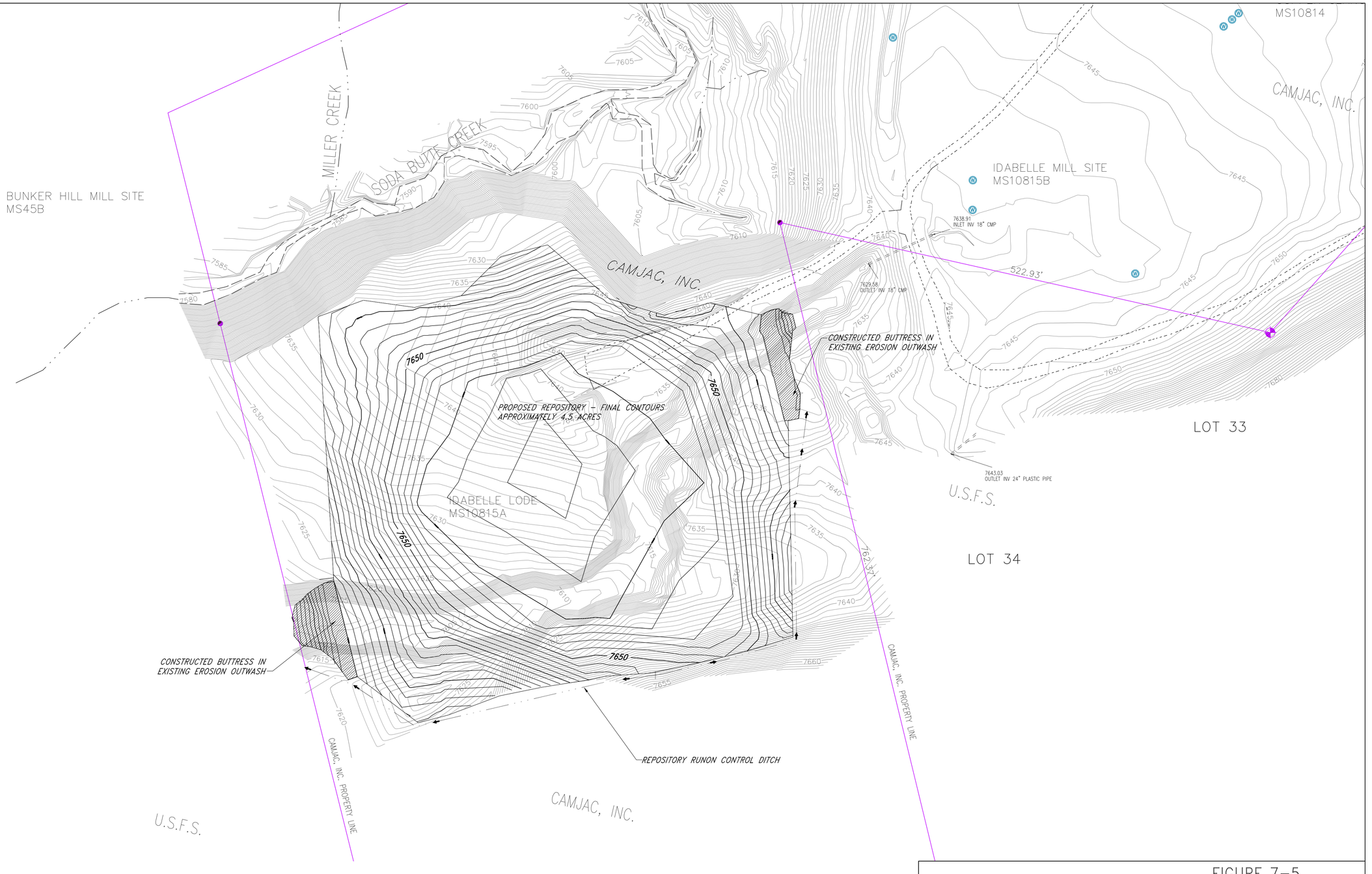
Screening Summary – Partial removal and in-place containment, may be a feasible and cost-effective remedy for the site. Alternative 4 has been retained for detailed analysis.

7.3.5 Alternative 5a: On-Site Disposal in a Fully Encapsulated Repository

Alternative 5a involves removing and permanently disposing of all on-site wastes (tailings, waste rock dump, and OSC wastes) in a fully encapsulated repository constructed on-site. The proposed repository site for Alternative 5a is located immediately southwest of the tailings impoundment, on the timbered bench above the south bank of Soda Butte Creek (see Figure 7-5). The proposed repository site is located entirely on CAMJAC, Inc. property (owner of the tailings impoundment and the majority of the waste rock dump).

Due to heavy timber at the proposed repository site, the area was not accessible with a backhoe or drill rig when Pioneer conducted the field investigation during the fall of 2001. Consequently, subsurface conditions in the repository area were not documented and soil samples were not collected. However, several soil samples were collected along the south perimeter of the tailings impoundment in 2001 (see Figure 3-1); results from these soil samples are assumed to be representative of the proposed repository area.

Under Alternative 5a, the repository excavation would be sized appropriately to provide enough cover soil for reclamation of the entire site. Based on analytical results from the 2001 field investigation, the potential vegetative cover soil contains very little organic matter (averaging < 1.0 percent), is nutrient-poor, and would require fertilizer application and amendment with organic matter to establish suitable plant growth. If Alternative 5a is chosen to be implemented at the site, the proposed repository area would need to be thoroughly investigated (prior to completing the detailed reclamation design for the site) to document geotechnical properties (i.e., soil texture, soil strength, compaction characteristics, depth-to-bedrock, etc.) and to confirm the characteristics and suitability of the material as cover soil. Additionally, installation of groundwater monitoring wells in this area is recommended to document depth-to-groundwater and associated static water level fluctuations. These data are necessary to determine the vertical separation between the bottom of the repository and seasonal high groundwater levels. Based on topographic data, it appears that over 20 feet of vertical separation between the bottom of the repository and the water table would be achieved (see Figure 7-6).



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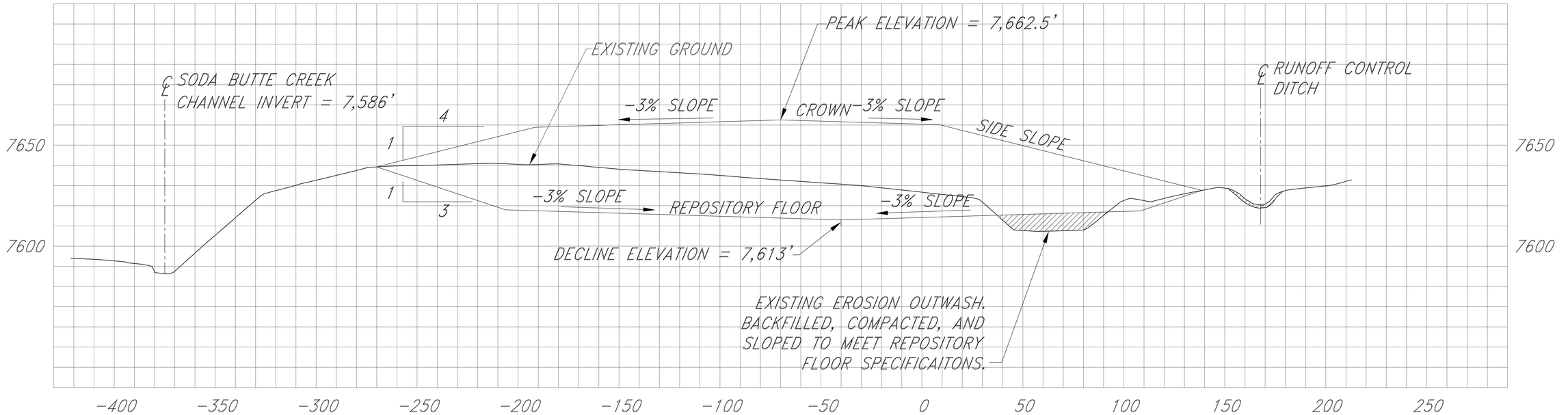
PIONEER TECHNICAL SERVICES, INC.

FIGURE 7-5
PROPOSED REPOSITORY
FOR ALTERNATIVES
5a, 5b, AND 5c

SCALE: 1"=50'
DATE: 5/13/02



PIONEER
TECHNICAL SERVICES, INC.

FIGURE 7-6
TYPICAL REPOSITORY
CROSS SECTION

SCALE: 1"=10'
DATE: 5/9/02

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Under Alternative 5a, the repository would be constructed to allow positive drainage with maximum side slopes of 4H:1V. The repository would consist of a single bottom liner system (including integral leachate collection and removal system) combined with a multi-layered cap (see Figure 7-3). As shown on Figures 7-6 and 7-7, the floor of the repository would slope toward a centrally located trench that runs the entire length of the repository. Bedded within this trench would be a perforated pipe designed to collect leachate via gravity drainage (leachate header pipe). After placement and final grading of all waste materials in the repository, the repository cap would be constructed. The vegetated cover component of the cap would be 2 feet thick (minimum).

Typically, annual precipitation exceeds annual evaporation at high altitude locations in western Montana (> 6,000 feet amsl), like the McLaren Tailings Site; consequently, the leachate header pipe would be constructed to drain to an underground storage tank (as opposed to an evaporation pond). The leachate storage tank would need to be routinely monitored to determine pumping frequency. Additionally, the collected leachate would need to be sampled and analyzed to determine appropriate disposal options. This is a monitoring and maintenance issue that would need to be resolved prior to implementing this alternative.

Under Alternative 5a, a total of 267,200 cubic yards of material would be disposed of in the repository (which includes 6 inches of potentially contaminated material underlying each of the waste sources caused by leaching and formation of precipitates). This quantity includes the tailings impoundment, the waste rock dump, and the OSC wastes. Based on the available data and the above considerations, the conceptual design for Alternative 5a includes:

- Installing BMPs along Soda Butte Creek to protect the creek during site reclamation activities;

- Installing a temporary bridge across Soda Butte Creek near the northwestern edge of the tailings to allow access to the site for the required equipment;

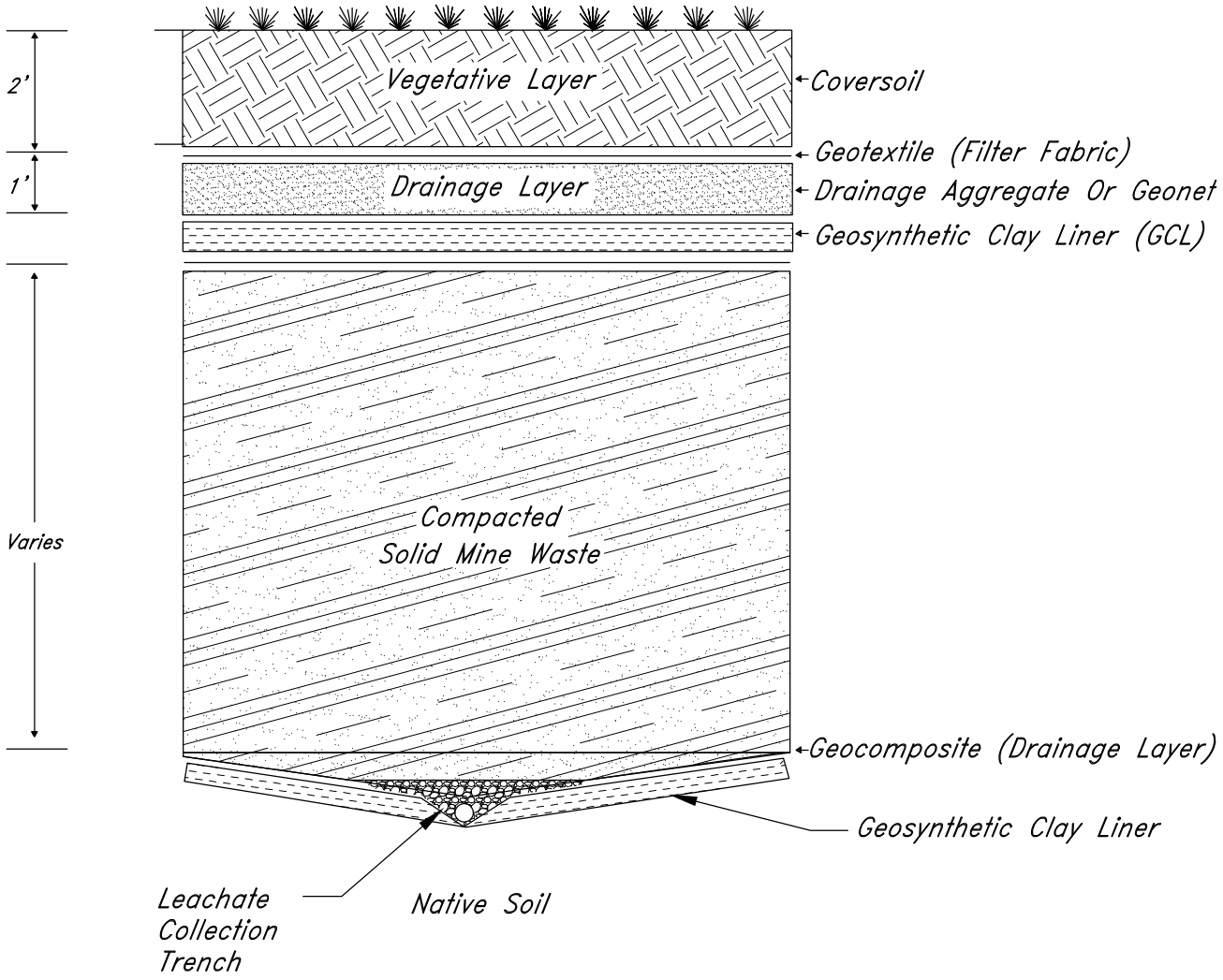
- Excavating and temporarily stockpiling approximately 30,000 cubic yards of existing cap material currently overlying the tailings impoundment (this material would be salvaged for use as a portion of the final cover over the waste rock dump and tailings footprints);

- Establishing access and excavating the repository (development of the repository would involve clearing and grubbing of approximately 5 acres of timber in this area);

- Constructing the repository bottom liner system (including leachate collection system);

- Excavating, transporting, and disposing of the tailings, waste rock and OSC wastes in the repository;

- Mixing lime with the waste materials to neutralize the acid generation potential of the wastes



PIONEER
TECHNICAL SERVICES, INC.

FIGURE 7-7
ALTERNATIVE 5a
TYPICAL FULLY ENCAPSULATED
REPOSITORY SECTION
SCALE: NA
DATE: 5/9/02

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and to aid in dehydrating the tailings to improve handling and compaction characteristics;

- Constructing the repository multi-layered cap including a 2-feet thick layer of vegetated cover;

- Installing salvaged cap material over the excavated waste rock dump and the tailings footprints at a thickness of 12 inches;

- Installing a 12-inch thick cap of clean cover soil over the surface of the excavated waste rock dump and tailings footprints (this would result in a final cover thickness of 2 feet over the excavated waste rock dump and tailings footprints);

- Installing diversion ditches to facilitate run-on/runoff control around the perimeter of the reclaimed areas;

- Re-establishing vertical and horizontal alignment and reconstructing Soda Butte Creek and Miller Creek (approximately 2,050 lineal feet); and

- Revegetating and mulching all disturbed areas upon completion of the construction activities (including roads, staging areas, stockpile areas, etc.).

Under Alternative 5a, seeding would take place during the fall of the year. The seed mixture and fertilizer would be applied simultaneously to the prepared seedbeds via drill application. Mulch would be applied to promote temporary protection of the disturbed surfaces. Straw mulch (certified weed-free) would be applied over the reclaimed materials with a tow spreader or pneumatic spreader utilizing tucking/crimping as the anchoring mechanism.

Run-on/runoff control would be achieved by construction of necessary diversion structures. Temporary surface water diversions (i.e., culvert, pipe, lined ditch, etc.) may need to be constructed and BMPs would be implemented to prevent runoff and sedimentation into Soda Butte Creek during the construction activities.

Effectiveness - By placing the waste materials in a fully encapsulated repository, this alternative would effectively reduce contaminant mobility at the site by removing the highest risk contaminant sources and disposing of the wastes in a secure disposal facility. Consequently, any potential surface water or wind erosion problems and direct contact risks associated with the site would be significantly reduced. Contaminant toxicity and volume would not be reduced; however, the waste would be rendered immobile and protected from surface water and wind erosion problems. Long-term monitoring and control programs would be established to ensure continued effectiveness.

The toxicity and volume of the wastes would not be reduced since no actual treatment of the contaminants would occur. The overall effectiveness of the containment/revegetation program would be enhanced by selecting appropriate plant species that are metal tolerant and adapted to

high altitudes and short growing seasons.

The performance of the fully encapsulated repository, from the standpoint of reducing infiltration of percolating leachate to groundwater, was estimated using EPA's Hydrologic Evaluation of Landfill Performance (HELP) Model (Version 3.0). Output from the HELP Model is included in Appendix F. Table 7-3 summarizes the performance of the Alternative 5a repository. As indicated on Table 7-3, construction of the Alternative 5a repository is predicted to reduce infiltration of leachate at the McLaren Tailings Site by 99.97 percent.

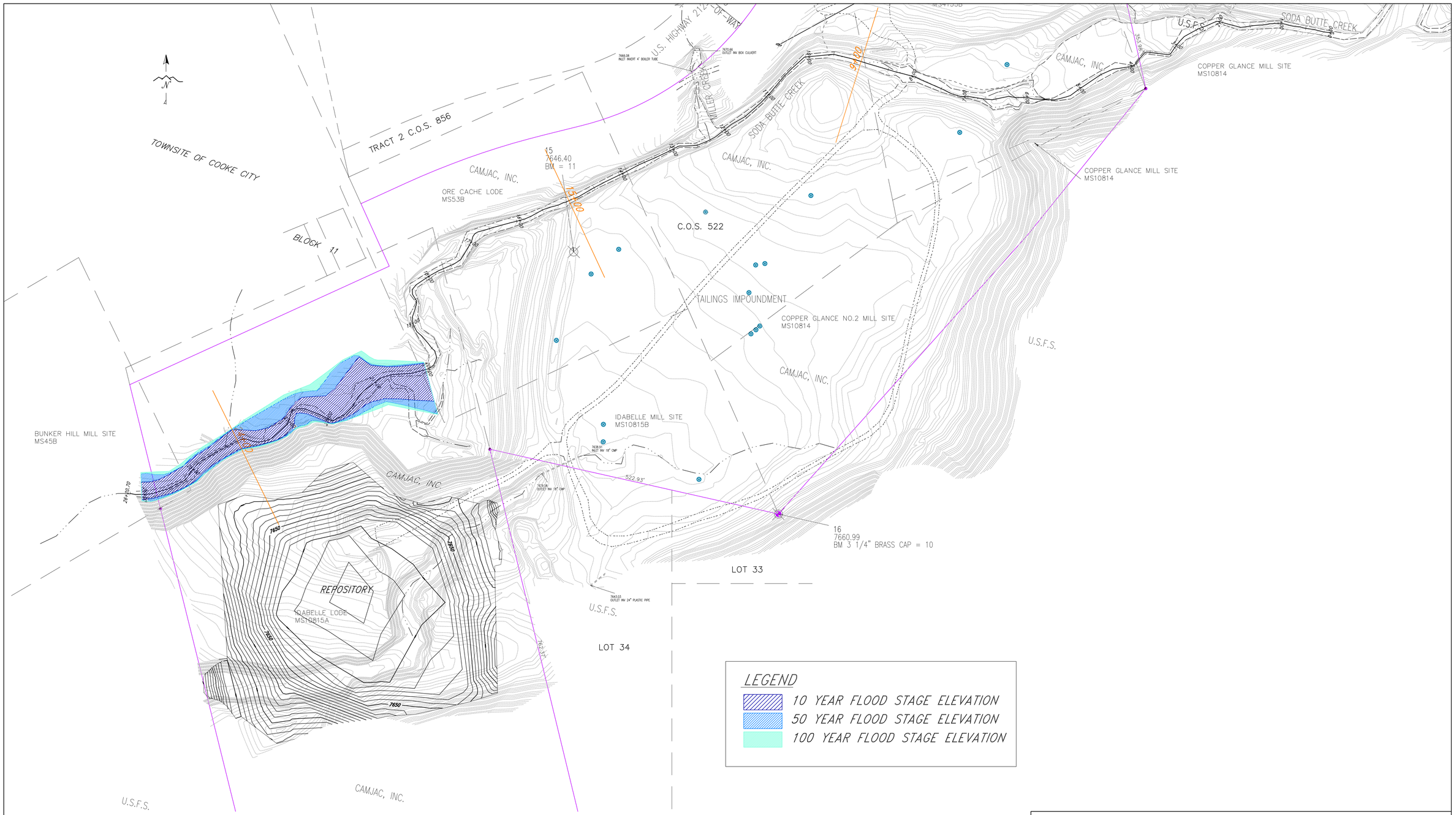
TABLE 7-3
INFILTRATION REDUCTION PROVIDED BY ALTERNATIVE 5A
(HELP MODEL RESULTS)

Source	Current Leachate Generation Rate (cubic feet/year)	Alternative 5a Leachate Generation Rate (cubic feet/year)	Reduction in Leachate Generation (%)
Waste Rock Dump	16,681	0	
Tailings	31,148	0	
Repository	0	15	
Total	47,829	15	99.97

Due to concerns of major flood events potentially encroaching on the proposed repository site, Soda Butte Creek (in its current configuration) was preliminarily analyzed for 10-, 50-, and 100-year flood events using the U.S. Army Corps of Engineers flood simulation program HEC-RAS (Hydrologic Engineering Center – River Analysis System). The objective of this analysis was to determine if published and computed flood volumes would encroach on the proposed repository site. As illustrated on Figure 7-8, the HEC-RAS simulations determined that the 10-, 50-, and 100-year flood events would not encroach on the proposed repository site (see Appendix H for a more detailed discussion of the HEC-RAS modeling effort). If Alternative 5a is implemented at the site, the preliminary HEC-RAS modeling results presented in Appendix H may be revisited during the detailed design phase of the project as additional data become available (specifically, additional topographic data along the north bank of Soda Butte Creek downstream from the tailings impoundment may be recommended).

Implementability - This alternative is both technically and administratively feasible. The construction steps required are considered standard/conventional construction practices. Repository construction, incorporation of amendments, soil covers, and establishing vegetation are readily implementable technologies that use conventional construction techniques as well. Design methods and requirements have been thoroughly tested and the necessary construction equipment and methods are readily available and widely used. Construction methods may vary depending on the complexity of the terrain and the required depth of amendment incorporation.

Factors that could limit the implementability of this alternative include the potential to encounter



PIONEER TECHNICAL SERVICES, INC.

FIGURE 7-8
McLAREN TAILINGS
HEC-RAS FLOOD ANALYSIS

SCALE: 1"=80'
DATE: 5/13/02

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significant groundwater beneath the tailings when excavating and attempting to operate heavy equipment on potentially wet tailings. If significant groundwater is encountered when excavating the materials, dewatering (i.e., pumping) will likely be required during construction. Additionally, pre-treatment of wet materials may be necessary to eliminate free liquids to attain compaction specifications in the repository. De-watering and/or pre-treatment, if required, could significantly increase project costs.

Cost Screening - The total capital cost for Alternative 5a has been estimated at $4,686,721.00. Cost estimate details are included on Table D-3 in Appendix D.

The following assumptions were used to calculate costs for Alternative 5a:

- A total of 267,200 cubic yards of waste materials would be excavated, transported, and compacted in the repository;
- An estimated 10,000 tons of lime would be required to neutralize the acid production characteristics of the wastes and to aid in dehydrating the tailings to improve handling and compaction characteristics;
- An estimated 47,000 cubic yards of vegetative cover would be required to cover the repository and the footprints of the excavated waste rock dump and tailings impoundment;
- The total surface area that would require revegetation under this alternative is 23.5 acres, which includes the repository, the footprints of the excavated waste rock dump and tailings impoundment, and other disturbed areas;
- Run-on/runoff control interceptor ditches would be required to protect the repository area and the reclaimed waste sources. A total of 2,500 lineal feet of ditches are assumed to be required; and
- Approximately 2,050 lineal feet of Soda Butte Creek and Miller Creek would require stream reconstruction.

Screening Summary – Disposal of all on-site wastes in a fully encapsulated repository, with subsequent reclamation of the excavated footprints, may be a feasible and cost-effective remedy for the site. Alternative 5a has been retained for detailed analysis.

7.3.6 Alternative 5b: On-Site Disposal in an Un-Lined Repository with a Multi-Layered Cap

Alternative 5b involves removing and permanently disposing of all on-site wastes (tailings, waste rock dump, and OSC wastes) in an un-lined repository with a multi-layered cap constructed on-site. The proposed repository site for Alternative 5b is located immediately southwest of the tailings impoundment, on the timbered bench above the south bank of Soda Butte Creek (see Figure 7-5). The proposed repository site is located entirely on CAMJAC, Inc. property (owner

of the tailings impoundment and the majority of the waste rock dump).

Due to heavy timber at the proposed repository site, the area was not accessible with a backhoe or drill rig when Pioneer conducted the field investigation during the fall of 2001. Consequently, subsurface conditions in the repository area were not documented and soil samples were not collected. However, several soil samples were collected along the south perimeter of the tailings impoundment in 2001 (see Figure 3-1); results from these soil samples are assumed to be representative of the proposed repository area.

Under Alternative 5b, the repository excavation would be sized appropriately to provide enough cover soil for reclamation of the entire site. Based on analytical results from the 2001 field investigation, the potential vegetative cover soil contains very little organic matter (averaging < 1.0 percent), is nutrient-poor, and would require fertilizer application and amendment with organic matter to establish suitable plant growth. If Alternative 5b is chosen to be implemented at the site, the proposed repository area would need to be thoroughly investigated (prior to completing the detailed reclamation design for the site) to document geotechnical properties (i.e., soil texture, soil strength, compaction characteristics, depth-to-bedrock, etc.) and to confirm the characteristics and suitability of the material as cover soil. Additionally, installation of groundwater monitoring wells in this area is recommended to document depth-to-groundwater and associated static water level fluctuations. These data are necessary to determine the vertical separation between the bottom of the repository and seasonal high groundwater levels. Based on topographic data, it appears that over 20 feet of vertical separation between the bottom of the repository and the water table would be achieved (see Figure 7-6).

Under Alternative 5b, the repository would be constructed to allow positive drainage with maximum side slopes of 4H:1V. The multi-layered cap would consist of an impermeable liner, a drainage layer, and the vegetated cover component of the cap would be 2 feet thick (minimum) (see Figure 7-9).

Under Alternative 5b, a total of 267,200 cubic yards of material would be disposed of in the repository (which includes 6 inches of potentially contaminated material underlying each of the waste sources caused by leaching and formation of precipitates). This quantity includes the tailings impoundment, the waste rock dump, and OSC wastes. Based on the available data and the above considerations, the conceptual design for Alternative 5b includes:

- Installing BMPs along Soda Butte Creek to protect the creek during site reclamation activities;

- Installing a temporary bridge across Soda Butte Creek near the northwestern edge of the tailings to allow access to the site for the required equipment;

- Excavating and temporarily stockpiling approximately 30,000 cubic yards of existing cap material currently overlying the tailings impoundment (this material would be salvaged for use as a portion of the final cover over the waste rock dump and tailings footprints);

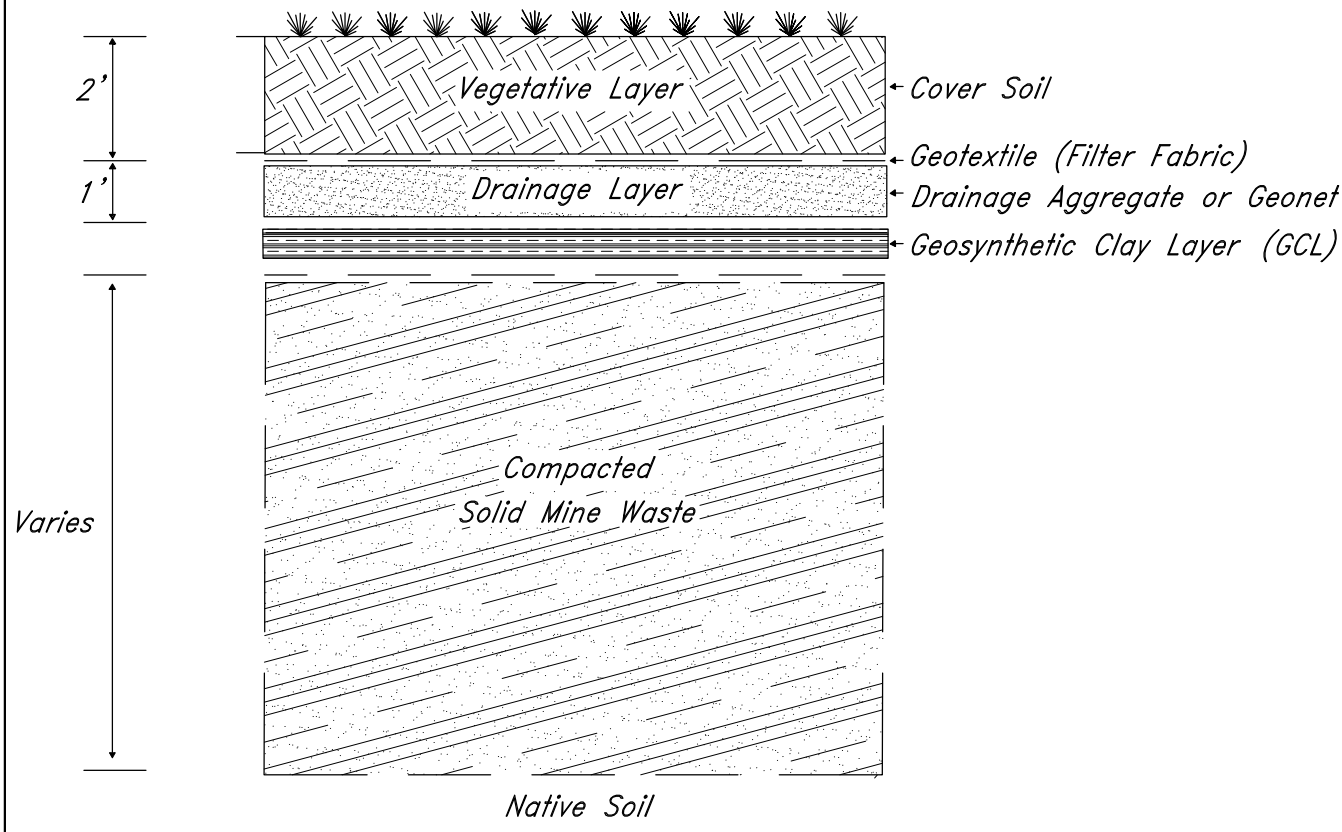

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FIGURE 7-9
ALTERNATIVE 5b
TYPICAL MULTI-LAYERED
CAP SECTION

SCALE: NA
DATE: 5/9/02

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- Establishing access and excavating the repository (development of the repository would involve clearing and grubbing of approximately five acres of timber in this area);
- Excavating, transporting, and disposing of the tailings, waste rock and OSC wastes in the repository;

- Mixing lime with the waste materials to neutralize the acid generation potential of the wastes and to aid in dehydrating the tailings to improve handling and compaction characteristics;

- Constructing the repository multi-layered cap including a 2 feet thick layer of vegetated cover;

- Installing salvaged cap material over the excavated waste rock dump and the tailings footprints at a thickness of 12 inches;

- Installing a 12-inch thick cap of clean cover soil over the surface of the excavated waste rock dump and tailings footprints (this would result in a final cover thickness of 2 feet over the excavated waste rock dump and tailings footprints);

- Installing diversion ditches to facilitate run-on/runoff control around the perimeter of the reclaimed areas;

- Re-establishing vertical and horizontal alignment and reconstructing Soda Butte Creek and Miller Creek (approximately 2,050 lineal feet); and

- Revegetating and mulching all disturbed areas upon completion of the construction activities (including roads, staging areas, stockpile areas, etc.).

Under Alternative 5b, seeding would take place during the fall of the year. The seed mixture and fertilizer would be applied simultaneously to the prepared seedbeds via drill application. Mulch would be applied to promote temporary protection of the disturbed surfaces. Straw mulch (certified weed-free) would be applied over the reclaimed materials with a tow spreader or pneumatic spreader utilizing tucking/crimping as the anchoring mechanism.

Run-on/runoff control would be achieved by construction of necessary diversion structures. Temporary surface water diversions (i.e., culvert, pipe, lined ditch, etc.) may need to be constructed and BMPs would be implemented to prevent runoff and sedimentation into Soda Butte Creek during the construction activities.

Effectiveness - By placing waste materials in an un-lined repository with a multi-layered cap, this alternative would effectively reduce contaminant mobility at the site by removing the highest risk contaminant source and disposing of the waste in a secure disposal facility. Consequently, any potential surface water or wind erosion problems and direct contact risks associated with the site would be significantly reduced. Contaminant toxicity and volume would not be reduced;

however, the waste would be rendered immobile and protected from surface water and wind erosion problems. Long-term monitoring and control programs would be established to ensure continued effectiveness.

The toxicity and volume of the wastes would not be reduced since no actual treatment of the contaminants would occur. The overall effectiveness of the containment/revegetation program would be enhanced by selecting appropriate plant species that are metal tolerant and adapted to high altitudes and short growing seasons.

The performance of the un-lined repository with a multi-layered cap, from the standpoint of reducing infiltration of percolating leachate to groundwater, was estimated using EPA's HELP Model (Version 3.0). Output from the HELP Model is included in Appendix F. Table 7-4 summarizes the performance of the Alternative 5b repository. As indicated on Table 7-4, construction of the Alternative 5b repository is predicted to reduce infiltration of leachate at the McLaren Tailings Site by 93.67 percent.

TABLE 7-4
INFILTRATION REDUCTION PROVIDED BY ALTERNATIVE 5B
(HELP MODEL RESULTS)

Source	Current Leachate Generation Rate (cubic feet/year)	Alternative 5b Leachate Generation Rate (cubic feet/year)	Reduction in Leachate Generation (%)
Waste Rock Dump	16,681	0	
Tailings	31,148	0	
Repository	0	3,028	
Total	47,829	3,028	93.67

Due to concerns of major flood events potentially encroaching on the proposed repository site, Soda Butte Creek (in its current configuration) was preliminarily analyzed for 10-, 50-, and 100-year flood events using the U.S. Army Corps of Engineers flood simulation program HEC-RAS (Hydrologic Engineering Center – River Analysis System). The objective of this analysis was to determine if published and computed flood volumes would encroach on the proposed repository site. As illustrated on Figure 7-8, the HEC-RAS simulations determined that the 10-, 50-, and 100-year flood events would not encroach on the proposed repository site (see Appendix H for a more detailed discussion of the HEC-RAS modeling effort). If Alternative 5b is implemented at the site, the preliminary HEC-RAS modeling results presented in Appendix H may be revisited during the detailed design phase of the project as additional data become available (specifically, additional topographic data along the north bank of Soda Butte Creek downstream from the tailings impoundment may be recommended).

Implementability - This alternative is both technically and administratively feasible. The construction steps required are considered standard/conventional construction practices.

Repository construction, incorporation of amendments, soil covers, and establishing vegetation are readily implementable technologies that use conventional construction techniques as well. Design methods and requirements have been thoroughly tested and the necessary construction equipment and methods are readily available and widely used. Construction methods may vary depending on the complexity of the terrain and the required depth of amendment incorporation.

Factors that could limit the implementability of this alternative include the potential to encounter significant groundwater beneath the tailings when excavating and attempting to operate equipment on potentially wet tailings. If significant groundwater is encountered when excavating the materials, dewatering (i.e., pumping) will likely be required during construction. Additionally, pre-treatment of wet materials may be necessary to eliminate free liquids to attain compaction specifications in the repository. De-watering and/or pre-treatment, if required, could significantly increase project costs.

Cost Screening - The total capital cost for Alternative 5b has been estimated at $4,170,877.00. Cost estimate details are included on Table D-4 in Appendix D.

The following assumptions were used to calculate costs for Alternative 5b:

- A total of 267,200 cubic yards of waste material would be excavated, transported, and compacted in the repository;

- An estimated 10,000 tons of lime would be required to neutralize the acid generation potential of the wastes and to aid in dehydrating the tailings to improve handling and compaction characteristics;

- An estimated 47,000 cubic yards of vegetative cover would be required to cover the repository and the footprints of the excavated waste rock dump and tailings impoundment;

- The total surface area that would require revegetation under this alternative is 23.5 acres, which includes the repository, the footprints of the excavated waste rock dump and tailings impoundment, and other disturbed areas;

- Run-on/runoff control interceptor ditches would be required to protect the repository area and the reclaimed waste sources. A total of 2,500 lineal feet of ditches are assumed to be required; and

- Approximately 2,050 lineal feet of Soda Butte Creek and Miller Creek would require stream reconstruction.

Screening Summary – Disposal of all wastes in an un-lined repository with a multi-layered cap, with subsequent reclamation of the excavated footprints, may be a feasible and cost-effective remedy for the site. Alternative 5b has been retained for detailed analysis.

7.3.7 Alternative 5c: On-Site Disposal in a Constructed Repository with a Soil Cover

Alternative 5c involves removing and permanently disposing of all on-site wastes (tailings, waste rock dump, and OSC wastes) in a constructed repository with a 2-feet thick soil cover. The proposed repository site for Alternative 5c is located immediately southwest of the tailings impoundment, on the timbered bench above the south bank of Soda Butte Creek (see Figure 7-5). The proposed repository site is located entirely on CAMJAC, Inc. property (owner of the tailings impoundment and the majority of the waste rock dump).

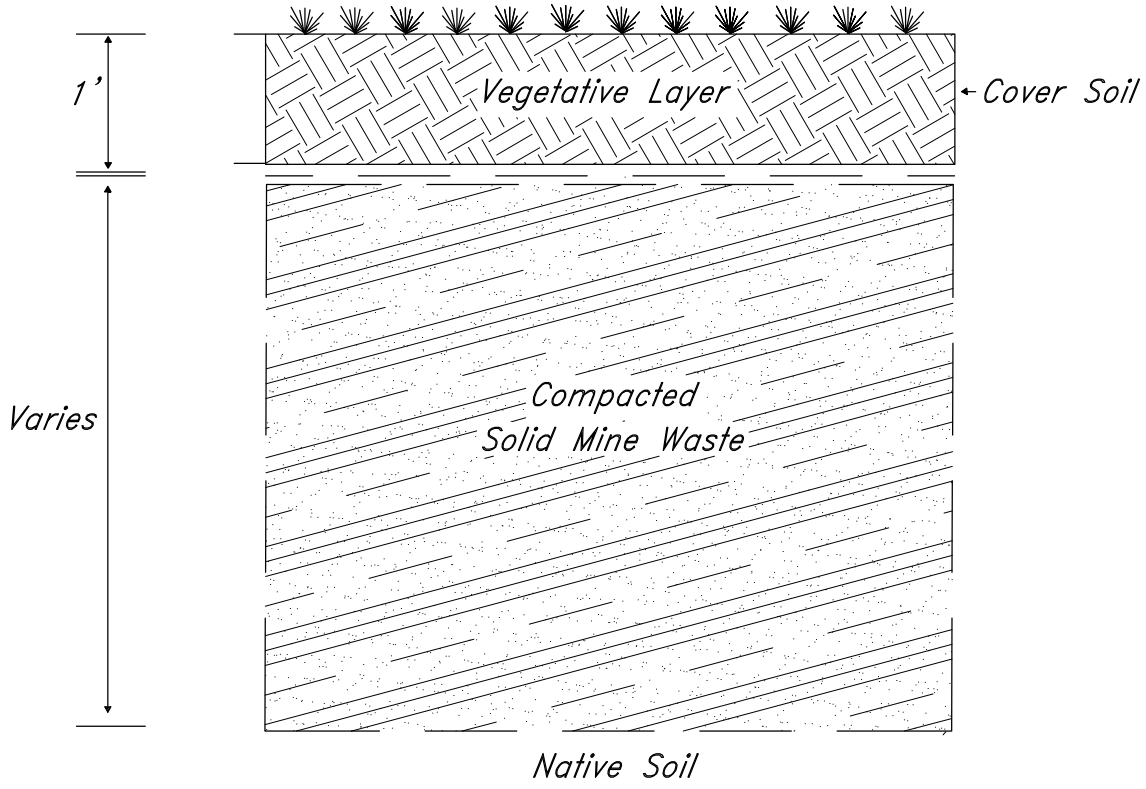
Due to heavy timber at the proposed repository site, the area was not accessible with a backhoe or drill rig when Pioneer conducted the field investigation during the fall of 2001. Consequently, subsurface conditions in the repository area were not documented and soil samples were not collected. However, several soil samples were collected along the south perimeter of the tailings impoundment in 2001 (see Figure 3-1); results from these soil samples are assumed to be representative of the proposed repository area.

Under Alternative 5c, the repository excavation would be sized appropriately to provide enough cover soil for reclamation of the entire site. Based on analytical results from the 2001 field investigation, the potential vegetative cover soil contains very little organic matter (averaging < 1.0 percent), is nutrient-poor, and would require fertilizer application and amendment with organic matter to establish suitable plant growth. If Alternative 5c is chosen to be implemented at the site, the proposed repository area would need to be thoroughly investigated (prior to completing the detailed reclamation design for the site) to document geotechnical properties (i.e., soil texture, soil strength, compaction characteristics, depth-to-bedrock, etc.) and to confirm the characteristics and suitability of the material as cover soil. Additionally, installation of groundwater monitoring wells in this area is recommended to document depth-to-groundwater and associated static water level fluctuations. These data are necessary to determine the vertical separation between the bottom of the repository and seasonal high groundwater levels. Based on topographic data, it appears that over 20 feet of vertical separation between the bottom of the repository and the water table would be achieved (see Figure 7-6).

Under Alternative 5c, the repository would be constructed to allow positive drainage with maximum side slopes of 4H:1V. The cap would consist of clean cover soil installed at a minimum depth of 2 feet (see Figure 7-10). A total of 267,200 cubic yards of material would be disposed of in the repository (which includes 6 inches of potentially contaminated material underlying each of the waste sources caused by leaching and formation of precipitates). This quantity includes the tailings impoundment, the waste rock dump, and OSC wastes. Based on the available data and the above considerations, the conceptual design for Alternative 5c includes:

- Installing BMPs along Soda Butte Creek to protect the creek during site reclamation activities;

- Installing a temporary bridge across Soda Butte Creek near the northwestern edge of the



PIONEER
TECHNICAL SERVICES, INC.

FIGURE 7-10
ALTERNATIVE 5c
TYPICAL REPOSITORY
SOIL COVER SECTION

SCALE: NA
DATE: 5/13/02

mc-eeeca-101.dwg

tailings to allow access to the site for the required equipment;

- Excavating and temporarily stockpiling approximately 30,000 cubic yards of existing cap material currently overlying the tailings impoundment (this material would be salvaged for use as a portion of the final cover over the waste rock dump and tailings footprints);

- Establishing access and excavating the repository (development of the repository would involve clearing and grubbing of approximately five acres of timber in this area);

- Excavating, transporting, and disposing of the tailings, waste rock and OSC wastes in the repository;

- Mixing lime with the waste materials to neutralize the acid generation potential of the wastes and to aid in dehydrating the tailings to improve handling and compaction characteristics;

- Installing the 2-feet thick soil cover over the repository;

- Installing salvaged cap material over the excavated waste rock dump and the tailings footprints at a thickness of 12 inches;

- Installing a 12-inch thick cap of clean cover soil over the surface of the excavated waste rock dump the tailings footprints (this would result in a final cover thickness of 2-feet over the excavated waste rock dump the tailings footprints);

- Installing diversion ditches to facilitate run-on/runoff control around the perimeter of the reclaimed areas;

- Re-establishing vertical and horizontal alignment and reconstructing Soda Butte Creek and Miller Creek (approximately 2,050 lineal feet); and

- Revegetating and mulching all disturbed areas upon completion of the construction activities (including roads, staging areas, stockpile areas, etc.).

Under Alternative 5c, seeding would take place during the fall of the year. The seed mixture and fertilizer would be applied simultaneously to the prepared seedbeds via drill application. Mulch would be applied to promote temporary protection of the disturbed surfaces. Straw mulch (certified weed-free) would be applied over the reclaimed materials with a tow spreader or pneumatic spreader utilizing tucking/crimping as the anchoring mechanism.

Run-on/runoff control would be achieved by construction of necessary diversion structures. Temporary surface water diversions (i.e., culvert, pipe, lined ditch, etc.) may need to be constructed and BMPs would be implemented to prevent runoff and sedimentation into Soda Butte Creek during the construction activities.

Effectiveness - By placing waste materials in a repository, this alternative would effectively reduce contaminant mobility at the site by removing the highest risk contaminant source and disposing of the waste in a more secure disposal facility. Consequently, potential surface water or wind erosion problems and direct contact risks associated with the site would be significantly reduced. Contaminant toxicity and volume would not be reduced; however, the waste would be stabilized and protected from surface water and wind erosion problems. Long-term monitoring and control programs would be established to ensure continued effectiveness.

The toxicity and volume of the wastes would not be reduced since no actual treatment of the contaminants would occur. The overall effectiveness of the containment/revegetation program would be enhanced by selecting appropriate plant species that are metal tolerant and adapted to high altitudes and short growing seasons.

The performance of the repository, from the standpoint of reducing infiltration of percolating leachate to groundwater, was estimated using EPA's HELP Model (Version 3.0). Output from the HELP Model is included in Appendix F. Table 7-5 summarizes the performance of the Alternative 5c repository. As indicated on Table 7-5, construction of the Alternative 5c repository is predicted to reduce infiltration of leachate at the McLaren Tailings Site by 89.17 percent.

TABLE 7-5
INFILTRATION REDUCTION PROVIDED BY ALTERNATIVE 5C
(HELP MODEL RESULTS)

Source	Current Leachate Generation Rate (cubic feet/year)	Alternative 5c Leachate Generation Rate (cubic feet/year)	Reduction in Leachate Generation (%)
Waste Rock Dump	16,681	0	
Tailings	31,148	0	
Repository	0	5,182	
Total	47,829	5,182	89.17

Due to concerns of major flood events potentially encroaching on the proposed repository site, Soda Butte Creek (in its current configuration) was preliminarily analyzed for 10-, 50-, and 100-year flood events using the U.S. Army Corps of Engineers flood simulation program HEC-RAS (Hydrologic Engineering Center – River Analysis System). The objective of this analysis was to determine if published and computed flood volumes would encroach on the proposed repository site. As illustrated on Figure 7-8, the HEC-RAS simulations determined that the 10-, 50-, and 100-year flood events would not encroach on the proposed repository site (see Appendix H for a more detailed discussion of the HEC-RAS modeling effort). If Alternative 5c is implemented at the site, the preliminary HEC-RAS modeling results presented in Appendix H may be revisited during the detailed design phase of the project as additional data become available (specifically, additional topographic data along the north bank of Soda Butte Creek downstream from the

tailings impoundment may be recommended).

Implementability - This alternative is both technically and administratively feasible. The construction steps required are considered standard/conventional construction practices. Repository construction, incorporation of amendments, soil covers, and establishing vegetation are readily implementable technologies that use conventional construction techniques as well. Design methods and requirements have been thoroughly tested and the necessary construction equipment and methods are readily available and widely used. Construction methods may vary depending on the complexity of the terrain and the required depth of amendment incorporation.

Factors that could limit the implementability of this alternative include the potential to encounter significant groundwater beneath the tailings when excavating and attempting to operate equipment on potentially wet tailings. If significant groundwater is encountered when excavating the materials, dewatering (i.e., pumping) will likely be required during construction. Additionally, pre-treatment of wet materials may be necessary to eliminate free liquids to attain compaction specifications in the repository. De-watering and/or pre-treatment, if required, could significantly increase project costs.

Cost Screening - The total capital cost for Alternative 5c has been estimated at $3,720,031.00. Cost estimate details are included on Table D-5 in Appendix D.

The following assumptions were used to calculate costs for Alternative 5c:

- A total of 267,200 cubic yards of waste materials would be excavated, transported, and compacted in the repository;

- An estimated 10,000 tons of lime would be required to neutralize the acid generation potential of the wastes and to aid in dehydrating the tailings to improve handling and compaction characteristics;

- An estimated 47,000 cubic yards of vegetative cover would be required to cover the repository and the footprints of the excavated waste rock dump and tailings impoundment;

- The total surface area that would require revegetation under this alternative is 23.5 acres, which includes the repository, the footprints of the excavated waste rock dump and tailings impoundment, and other disturbed areas;

- Run-on/runoff control interceptor ditches would be required to protect the repository area and the reclaimed waste sources. A total of 2,500 lineal feet of ditches are assumed to be required; and

- Approximately 2,050 lineal feet of Soda Butte Creek and Miller Creek would require stream reconstruction.

Screening Summary – Disposal of all wastes in a repository with a soil cover, with subsequent reclamation of the excavated footprints, may be a feasible and cost-effective remedy for the site. Alternative 5c has been retained for detailed analysis.

7.3.8 Alternative 6: Off-Site Disposal in a Nearby Mine Waste Repository

Several abandoned mine sites exist in close vicinity to Cooke City, Montana, within the New World Mining District. It is very possible that State and Federal Agencies may determine that a cost-effective strategy for dealing with these multiple mine sites includes constructing one or more large, centrally-located mine waste repository(s) to permanently contain waste materials from abandoned mines throughout the region. For the purpose of this alternative, it is assumed that a regional mine waste repository would be available to contain the McLaren Tailings Site wastes, and it would be located within approximately five miles from the site.

Under this alternative, a total of 267,200 cubic yards of waste materials (tailings impoundment, waste rock dump, and OSC wastes) would be disposed of in the regional repository. The resulting excavated waste source footprints would be covered with 12 inches of cover soil and revegetated. Based on the available data and the above considerations, the conceptual design for Alternative 6 includes:

- Installing BMPs along Soda Butte Creek to protect the creek during site reclamation activities;
- Installing a temporary bridge across Soda Butte Creek near the northwestern edge of the tailings to allow access to the site for the required equipment;
- Excavating and temporarily stockpiling approximately 30,000 cubic yards of existing cap material currently overlying the tailings impoundment (this material would be salvaged for use as a portion of the final cover over the waste rock dump and tailings footprints);
- Establishing access and developing the proposed borrow area located immediately southwest of the tailings impoundment (development of the borrow area would involve clearing and grubbing of approximately four acres of timber in this area);
- Excavating, transporting, and disposing of the tailings, waste rock and OSC wastes in the regional repository;
- Mixing lime with the waste materials to neutralize the acid generation potential of the wastes and to aid in dehydrating the tailings to improve handling and compaction characteristics;
- Installing salvaged cap material over the excavated waste rock dump and the tailings footprints at a thickness of 12 inches;

- Installing a 12-inch thick cap of clean cover soil over the surface of the excavated waste rock dump the tailings footprints (this would result in a final cover thickness of 2 feet over the excavated waste rock dump the tailings footprints);

- Installing diversion ditches to facilitate run-on/runoff control around the perimeter of the reclaimed areas;

- Re-establishing vertical and horizontal alignment and reconstructing Soda Butte Creek and Miller Creek (approximately 2,050 lineal feet); and

- Revegetating and mulching all disturbed areas upon completion of the construction activities (including roads, staging areas, stockpile areas, etc.).

The proposed borrow area for Alternative 6 is located immediately southwest of the tailings impoundment, on the timbered bench above the south bank of Soda Butte Creek (see Figure 7-1). The proposed borrow area is located entirely on CAMJAC, Inc. property (owner of the tailings impoundment and the majority of the waste rock dump). Due to heavy timber in this area, the proposed borrow area was not accessible with a backhoe or drill rig when the field investigation was conducted by Pioneer during the fall of 2001. Consequently, subsurface conditions in the proposed borrow area were not documented and soil samples were not collected. However, several soil samples were collected along the south perimeter of the tailings impoundment in 2001 (see Figure 3-1); results from these soil samples are assumed to be representative of the proposed borrow area.

Based on analytical results from the field investigation, the potential vegetative cover soil contains very little organic matter (averaging < 1.0 percent), is nutrient-poor, and will require fertilizer application and amendment with organic matter to establish suitable plant growth. If Alternative 6 is chosen to be implemented at the site, the proposed borrow area will need to be thoroughly investigated (prior to completing the detailed reclamation design for the site) to confirm the characteristics and suitability of the cover soil.

Under Alternative 6, seeding would take place during the fall of the year. The seed mixture and fertilizer would be applied simultaneously to the prepared seedbeds via drill application. Mulch would be applied to promote temporary protection of the disturbed surfaces. Straw mulch (certified weed-free) would be applied over the reclaimed materials with a tow spreader or pneumatic spreader utilizing tucking/crimping as the anchoring mechanism.

Run-on/runoff control would be achieved by construction of necessary diversion structures. Temporary surface water diversions (i.e., culvert, pipe, lined ditch, etc.) may need to be constructed and BMPs would be implemented to prevent runoff and sedimentation into Soda Butte Creek during the construction activities.

Effectiveness – By permanently removing and disposing of all wastes at an off-site facility, this alternative would effectively eliminate contaminant mobility at the site by removing the highest risk solid media contaminant sources and disposing of the wastes in a secure disposal facility. Consequently, any potential surface water or wind erosion problems associated with the site would be corrected. Contaminant toxicity would not be reduced; however, approximately 267,200 cubic yards of material would be permanently removed from the site. Long-term monitoring and control programs would be established to ensure continued effectiveness at the disposal facility.

Implementability – This alternative is both technically and administratively feasible. The construction steps required are considered standard/conventional construction practices. Key project components, such as the availability of equipment, materials, and construction expertise, are all present and would help ensure the timely implementation and successful execution of the proposed plan.

Factors that could limit the implementability of this alternative include the potential to encounter significant groundwater beneath the tailings when excavating, and attempting to operate equipment on potentially wet tailings. If significant groundwater is encountered when excavating the materials, dewatering (i.e., pumping) will likely be required during construction. Additionally, pre-treatment of wet materials may be necessary to eliminate free liquids to attain compaction specifications in the repository. De-watering and/or pre-treatment, if required, could significantly increase project costs.

Cost Screening - The total capital cost for Alternative 6 has been estimated at $7,107,655.00. Cost estimate details are included on Table D-6 in Appendix D.

The following assumptions were used to calculate costs for Alternative 6:

- A total of 267,200 cubic yards of waste material would be excavated, transported, and compacted in the off-site regional repository;

- An estimated 10,000 tons of lime would be required to neutralize the acid generation potential of the wastes and to aid in dehydrating the tailings to improve handling and compaction characteristics;

- An estimated 30,000 cubic yards of vegetative cover would be required to cover the excavated footprints of the tailings impoundment and the waste rock dump;

- The total surface area that would require revegetation under this alternative is 22.5 acres, which includes the repository, the footprints of the excavated waste rock dump and tailings impoundment, and other disturbed areas;

- Run-on/runoff control interceptor ditches would be required to protect the repository area and the reclaimed waste sources. A total of 2,000 lineal feet of ditches are assumed to be required; and

- Approximately 2,050 lineal feet of Soda Butte Creek and Miller Creek would require stream reconstruction.

Screening Summary - Disposal of all wastes in a nearby regional repository, with subsequent reclamation of the excavated tailings and waste rock footprints, may be a feasible and cost-effective remedy for the site. Alternative 6 has been retained for detailed analysis.

7.3.9 Alternative 7: Off-Site Disposal in a Montana Class II Landfill

Alternative 7 involves removing and disposing of all wastes present at the McLaren Mine Site in a Montana Class II Solid Waste Landfill. A total of 267,200 cubic yards of waste material would be disposed of at the landfill under this alternative. The resulting excavated waste source footprints would be covered with 12-inches of cover soil and revegetated. Based on the available data, the conceptual design for Alternative 7 includes:

- Installing BMPs along Soda Butte Creek to protect the creek during site reclamation activities;

- Installing a temporary bridge across Soda Butte Creek near the northwestern edge of the tailings to allow access to the site for the required equipment;

- Excavating and temporarily stockpiling approximately 30,000 cubic yards of existing cap material currently overlying the tailings impoundment (this material would be salvaged for use as a portion of the final cover over the waste rock dump footprint and tailings footprint);

- Establishing access and developing the proposed borrow area located immediately southwest of the tailings impoundment (development of the borrow area would involve clearing and grubbing of approximately 4 acres of timber in this area);

- Excavating, transporting, and disposing of the tailings, OSC wastes, and waste rock dump in the Landfill;

- Mixing lime with the waste materials to neutralize the acid generation potential of the wastes and to aid in dehydrating the tailings to improve handling and compaction characteristics;

- Installing salvaged cap material over the excavated waste rock dump and the tailings footprints at a thickness of 12-inches;

- Installing a 12-inch thick cap of clean cover soil over the surface of the excavated waste rock dump the tailings footprints (this would result in a final cover thickness of 2-feet over the excavated waste rock dump the tailings footprints);

- Installing diversion ditches to facilitate run-on/runoff control around the perimeter of the

reclaimed areas;

- Re-establishing vertical and horizontal alignment and reconstructing Soda Butte Creek and Miller Creek (approximately 2,050 lineal feet); and

- Revegetating and mulching all disturbed areas upon completion of the construction activities (including roads, staging areas, stockpile areas, etc.).

The proposed borrow area for Alternative 7 is located immediately southwest of the tailings impoundment, on the timbered bench above the south bank of Soda Butte Creek (see Figure 7-1). The proposed borrow area is located entirely on CAMJAC, Inc. property (owner of the tailings impoundment and the majority of the waste rock dump). Due to heavy timber in this area, the proposed borrow area was not accessible with a backhoe or drill rig when the field investigation was conducted by Pioneer during the fall of 2001. Consequently, subsurface conditions in the proposed borrow area were not documented and soil samples were not collected. However, several soil samples were collected along the south perimeter of the tailings impoundment in 2001 (see Figure 3-1); results from these soil samples are assumed to be representative of the proposed borrow area.

Based on analytical results from the field investigation, the potential vegetative cover soil contains very little organic matter (averaging < 1.0 percent), is nutrient-poor, and will require fertilizer application and amendment with organic matter to establish suitable plant growth. If Alternative 7 is chosen to be implemented at the site, the proposed borrow area will need to be thoroughly investigated (prior to completing the detailed reclamation design for the site) to confirm the characteristics and suitability of the cover soil.

Under Alternative 7, seeding would take place during the fall of the year. The seed mixture and fertilizer would be applied simultaneously to the prepared seedbeds via drill application. Mulch would be applied to promote temporary protection of the disturbed surfaces. Straw mulch (certified weed-free) would be applied over the reclaimed materials with a tow spreader or pneumatic spreader utilizing tucking/crimping as the anchoring mechanism.

Run-on/runoff control would be achieved by construction of necessary diversion structures. Temporary surface water diversions (i.e., culvert, pipe, lined ditch, etc.) may need to be constructed and BMPs would be implemented to prevent runoff and sedimentation into Soda Butte Creek during the construction activities.

Effectiveness – By disposing of all waste materials at a Montana Class II Landfill, this alternative would eliminate contaminant mobility at the site by removing the highest risk solid media contaminant sources and disposing of the waste in a secure disposal facility. Consequently, any surface water erosion problems associated with the site would be permanently corrected. Contaminant toxicity and volume would not be reduced; however, the waste would be permanently removed from the site.

Implementability – Disposing of waste materials at a Montana Class II Landfill is both technically and administratively feasible. The construction steps required are considered standard/conventional construction practices. Key project components, such as the availability of equipment, materials, and construction expertise, are all present and would help ensure the timely implementation and successful execution of the proposed plan.

Factors that could limit the implementability of this alternative include the potential to encounter significant groundwater beneath the tailings when excavating the new channel alignments, and attempting to cut slopes and operate equipment on potentially wet tailings. If significant groundwater is encountered when excavating the materials, dewatering (i.e., pumping) will likely be required during construction. Additionally, pre-treatment of wet materials may be necessary to eliminate free liquids. De-watering and/or pre-treatment, if required, could significantly increase project costs.

Cost Screening - The total capital cost for Alternative 7 has been estimated at $19,260,418.00. Cost estimate details are included on Table D-7 in Appendix D.

The following assumptions were used to calculate costs for Alternative 7:

- The nearest Montana Class II Solid Waste Landfill with capacity to accept 267,200 cubic yards of mine wastes is located in Billings, Montana, (approximately 130 miles from the site);

- A total of 267,200 cubic yards of waste material would be excavated, transported and disposed in the landfill;

- An estimated 10,000 tons of lime would be required to neutralize the acid generation potential of the wastes and to aid in dehydrating the tailings to improve handling and compaction characteristics;

- An estimated 30,000 cubic yards of vegetative cover would be required to cover the excavated footprints of the tailings impoundment and waste rock dump;

- The total surface area that would require revegetation under this alternative is 22.5 acres, which includes the excavated footprints of the waste sources and the borrow area and other disturbed areas;

- Run-on/runoff control interceptor ditches would be required to protect the repository area and the reclaimed waste sources. A total of 2,000 lineal feet of ditches are assumed to be required; and

- Approximately 2,050 lineal feet of Soda Butte Creek and Miller Creek would require stream reconstruction.

Screening Summary – Alternative 7 would provide virtually 100 percent risk reduction at the site; however, at over $19 million to implement, it is considered cost-prohibitive and will not be retained for detailed analysis.

7.4 SUMMARY OF ALTERNATIVE SCREENING

Table 7-3 summarizes the findings of the preliminary evaluation and screening. Costs generated and summarized on this table are capital costs only and do not include potential monitoring and maintenance costs.

TABLE 7-6
PRELIMINARY EVALUATION AND SCREENING OF ALTERNATIVES

ALTERNATIVE	EFFECTIVENESS	IMPLEMENTABLE	ESTIMATED COST	RETAINED FOR DETAILED ANALYSIS
Alternative 1: No Action	NA	NA	$0.00	Yes
Alternative 2: Institutional Controls	Low	Yes	$90,000	No
Alternative 3: In-Place Containment	Low-Moderate	Yes	$1,093,960.00	No
Alternative 4: Partial Removal and In-Place Containment	Moderate	Yes	$2,709,112.00	Yes
Alternative 5a: On-Site Disposal in a Fully Encapsulated Repository	High	Yes	$4,686,721.00	Yes
Alternative 5b: On-Site Disposal in an Un-Lined Repository with a Multi-Layered Cap	High	Yes	$4,170,877.00	Yes
Alternative 5c: On-Site Disposal in a Constructed Repository with a Soil Cover	Moderate-High	Yes	$3,720,031.00	Yes
Alternative 6: Off-Site Disposal in a Nearby Mine Waste Repository	High	Yes	$7,107,655.00	Yes
Alternative 7: Off-Site Disposal in a Montana Class II Landfill	High	Yes	$19,260,418.00	No